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VIEWS, NEWS AND INTERVIEWS.

The Brown Telephone and Telegraph Company, of Chicago, offers to furnish telephones for $25 a year and those to the city at $1 a year. Fred. H. Brown, the general manager of the company, says that it will begin the manufacture of instruments immediately after March 7 next, the date of the expiration of the Bell fundamental patent. Mr. Brown argues that with 10,000 subscribers to the telephone service there would be an annual saving of $750,000 to the citizens. The company has been in existence a month and will soon float, if it can, $5,000,000 worth of stock.

There seems to be some ground for belief that "Electricity in its Relation to Medicine" will come into use as an anæsthetic. At a recent meeting of a medical society, it is declared, a paper on this subject produced the desired effect.

Some brass condenser tubes in the United States cruiser "Baltimore," after being in service for a year or more, were found to have experienced a peculiar change. In many places the metal was changed to almost pure copper, of a spongy texture, the zinc having entirely disappeared. An investigation showed the probable cause of the failure to have been an electrolytic action between the tin lining of the tubes and the brass, the sea water circulating through the condenser forming the electrolyte. If the coating of the tin had remained perfect, there would have been no corrosion; but the foreign bodies, such as mud and grit, carried in suspension through the condenser cut away the tin coating in spots, and it was at these spots that the electrolytic action occurred. A natural conclusion was that had the tubes not been tinned, they would have remained intact.

A peculiar example of Parisian eccentricity is given by a man named Mixime Lisbonne, a charlatan Communist, who drives around the city in a carriage propelled by electricity selling "revolutionary fried potatoes" to the mob. This volatile Frenchman has many times opened a *Taverne de Bagne*, in which the attendants were dressed as convicts, and he wished the imitation to approach so near to the real that he would have balls and chains encumbering their feet. The walls of this peculiar hostlery were covered with portraits of convicts, and every evening at nine o'clock the guillotine execution of a wax figure would take place.

It seems that Governor Flower is very much in earnest in his advocacy of the equipment of the Erie Canal with the trolley system. The governor estimates the cost at $1,000,000, of which $700,000 would be required for 14 power houses along the line of the canal, and the other $300,000 for line equipment. It is thought that the cost of the necessary outfit for each boat would not exceed $200. The governor believes that the State could furnish power to the boatmen at about 60 cents per day. This amount is only a small fraction of what it now costs to feed and care for horses and mules. The constant repairs necessary in the tow path would be done away with and many other incidental expenses would be curtailed. The benefits arising from this change in motive power are obvious. We hope to see the Empire State lead off in this instance.

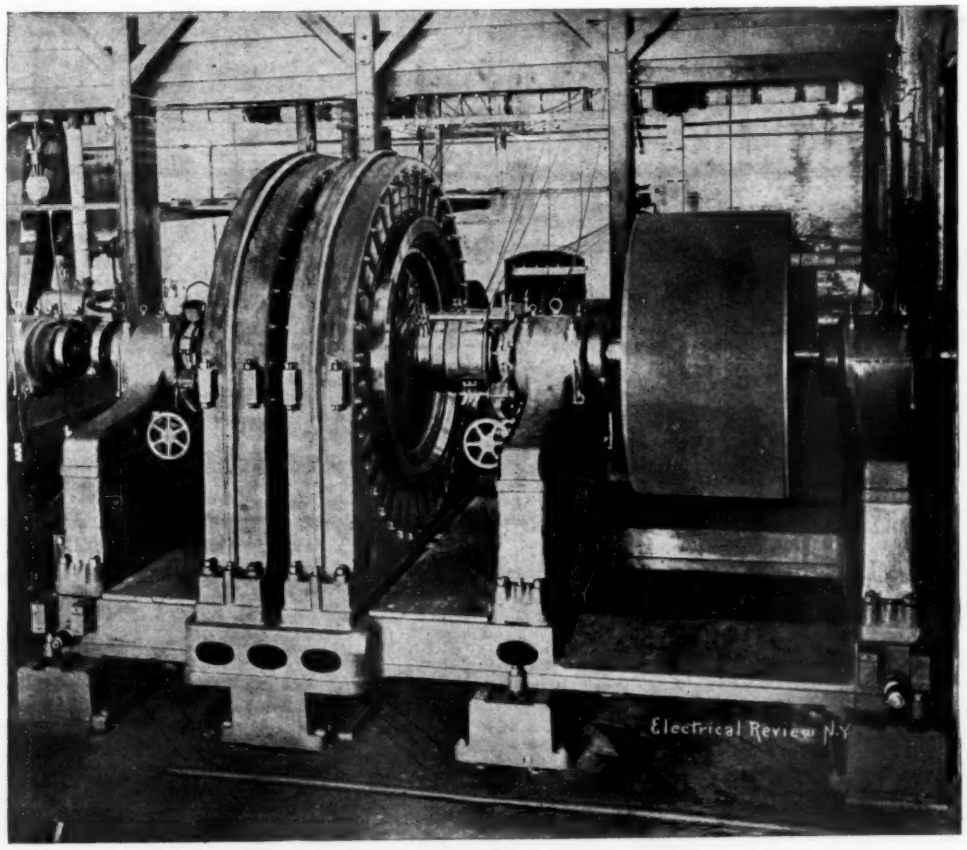


FIG. 1.—ONE OF THE 15,000-LIGHT WESTINGHOUSE GENERATORS FOR THE WORLD'S FAIR—EXHIBITED AT THE ALLEGHENY FACTORY OF THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.

It is rumored that an ingenious inventor is going to patent an electro keyhole finder. Those who have seen the apparatus declare that it will be a great boon to the gentlemen who are detained down town late at night by business. A battery is the source of power, and as soon as the key touches the door plate, by some contrivance not explained, a light appears whose rays shine through the keyhole and, like a pillar of fire by night, directs the unsteady hand to the proper point.

Several ambitious telephone companies are cropping up in Chicago. They make brilliant offers of cheaper service, etc., and the people whom their agents approach listen eagerly to their stories loaded with promises, but do not apparently invest very rapidly.

A Direct Reading Telephone Directory.

A Birmingham, Conn., inventor has constructed "a very ingenious device," writes a local newspaper. "The thing works just like a window curtain, and the names of the subscribers are all printed on one side of the sheet. When a person wants to consult the directory he goes to the roll, pulls down the sheet and looks up the number, and then, when through, lets it fly back just as you let a curtain roll up. It is a very convenient arrangement and has the advantage of presenting all the names in the exchange to the eye of the user at once. One of these directories is on exhibition at the telephone exchange in the city."

One of these "ingenious devices" would be quite a curiosity in this city, and if brought into use every telephone set would have to be situated at the end of a long alleyway, so that when a person wishes to consult the directory he would be obliged to grasp the end of the roll in one hand, sprint down to the other end of the alley, cast his eye along the list of the thousands of subscribers, and pin his gaze on the name sought for. Then, perhaps, when he is all through, the line will be in use, or the operator will say, "Number, please" (which he has forgotten by this time), and the process would have to be repeated.

But then, possibly, this is only intended for small towns, so we need have no fear of its introduction into New York.

The annual report of the Chicago Edison Company shows net earnings at the rate of 32 per cent. on the stock as it stood at the close of the year, the stock having been increased during the year 50 per cent.

JOURNEY JOTTINGS.

RANDOM NOTES PICKED UP BY A WANDERING REVIEWITE—LATEST ELECTRICAL NEWS FROM PHILADELPHIA, PITTSBURGH AND ST. LOUIS.

(*Editorial Correspondence.*)

Dr. Plush gives a very encouraging report of the operations of the Bell Telephone Company of Philadelphia for the year ending December 25. He says that Philadelphia runs higher than any other city in the number of its telephone calls. The company has about 3,250 subscribers located in the main district bounded by the Delaware and Schuylkill rivers, Kensington and the "Neck." About 20,000 connections a day are made for these subscribers, and over 8,000,000 connections were made during the year ending last Christmas. The lines of the company were begun on the underground system in October, 1891, and now the work is almost completed.

The Pittsburgh and Fort Wayne Railroad is getting ready for the rush to the World's Fair by double tracking its road from Pittsburgh west. The surveys for this line have already commenced, and when the job is finished all the road will be double tracked, except one nine-mile stretch.

The members of the Pittsburgh Electric Club had a good time on Saturday evening, the 22nd. A reading recital was given by Mr. George P. Fisher, of the Pennsylvania Company. His selections were from Eugene Field's "A Little Book of Western Verse" and included some of the Chicago poet's best efforts. Mr. Fisher was followed by Mr. Joseph Briel, who sang several songs accompanied by Mr. H. P. Ecker on the piano. The club is in a very flourishing condition, and President Morris Mead and the other club workers are to be congratulated on their efforts.

I am glad to be able to send you some pictures which, I think, will interest every REVIEW reader. They show portions of the Westinghouse exhibit at the old air-brake shops in Allegheny, which was held during the week beginning January 16. Several of the immense World's Fair generators were shown and two were in operation. Part of the current generated by them was used to run the 200 new type Westinghouse lamps which formed another and not less interesting portion of the exhibit. About 3,000 people accepted the invitation of the Westinghouse Electric and Manufacturing Company to view these monster dynamos and the ingenious stopper lamp.

The generators stand about 20 feet high and weigh 75 tons apiece. Each has a maximum capacity of 15,000 sixteen candle-power lamps, and requires the best efforts of a 1,000 horse-power engine to drive it. The armature is about 90 inches in diameter, weighs 45,000 pounds and makes about 260 revolutions per minute. The belt which drives the pulley wheel is 34 inches wide.

The construction of these elephantine dynamos has developed some entirely new problems in the designing of accessory detail apparatus. Mr. Alexander J. Wurts, of the Westinghouse Company's electrical staff, spent the night of January 23 in making experimental tests of these machines, with a view to obtaining data for use in designing change-over switches, fuse blocks and other necessary devices. The field discharges of these machines are naturally enormous, and the immense energy which they develop will require special apparatus for its control. In the foreground of Fig. 2 will be noticed a railroad track. This is a special spur from the Pittsburgh and Fort Wayne Railroad, which runs through the old air-brake shops. The big dynamos will be loaded on cars right in the shops, and will not again require handling until they are unloaded at the World's Fair grounds.

The exhibition board shown in Fig. 2 was equipped with a bank of new stopper lamps, a meter, stage regulator, and, in fact, the whole alternating current system was shown in operation. The direct coupled Westinghouse generator and engine seen on the right in this picture furnish current to the big electric crane and the motors in the shops.

The contract for lighting the World's Fair requires the necessary machinery, wiring and lamps for a minimum of 92,000 sixteen candle-power lamps. The company will supply 12 large generators, each of a maximum capacity of 15,000 sixteen candle-power lamps. Six of these will be driven by Westinghouse Machine Company engines, having their shafts connected directly to those of the generators, and six will be belt-driven by engines supplied by other exhibitors. The total horse-power of the engines will aggregate 12,000, so that this plant will greatly exceed in capacity any of the large lighting stations of the world. The company will, in addition to the above, have a very extensive exhibit in Electricity Hall, illustrating high tension long distance power transmission, and the many forms of generators and motors made by it. The power for the operation of this exhibit will be taken from the large generators above referred to, which have been especially designed to give double currents (now generally called multiphase currents) for the operation of Tesla motors, as well as for lighting. There will be in this exhibit many illustrations of recent advances in generating and using electricity, with illustrations of some especially interesting scientific phenomena.

The new stopper incandescent lamps, now being manufactured by this company, will be exclusively used. At least 92,000 of these lamps will be required by the time the Exhibition opens, and it is anticipated that the requirements of exhibitors will increase the number to 130,000 or more. Allowing an average life of 600 hours for each lamp, there will be required for daily renewals fully 1,000 new lamps. The company proposes, if it can secure the needed space, to make, as part of its exhibit, a model lamp factory where it will produce new lamps and renew the carbon burners of those burned out, thereby making a most interesting and instructive exhibit, and at the same time effecting a saving in the cost of lamp renewals.

The following particulars relating to the Westinghouse Electric and Manufacturing Company's business may prove interesting. The company has three factories in operation; one on Garrison alley, Pittsburgh; a second (the old air-brake works) in Allegheny, and the third in Newark, N. J. There are employed to-day 1,265 operatives in Pittsburgh and Allegheny, and 485 in Newark. With the spare room and new tools now in these factories there can be employed about 1,000 more men. The present output of all of these factories aggregate $575,000 per month, and this can, with present facilities, be increased to about $800,000 per month to meet demands. The machinery now erected is sufficient in size to make generators of 5,000 horse-power capacity, such as are now wanted by the Niagara Cataract Construction Company. As customers of the company there are now 604 central lighting stations; 2,300 isolated lighting plants, and 200 electric street railways using its apparatus; and among these railways are the leading ones of the large cities, notably in New York, Philadelphia, Brooklyn, Chicago, St. Louis, Cincinnati, Cleveland, Pittsburgh, Rochester and Albany. The company can now readily turn out 200 motors each week, or sufficient for 5,000 cars per annum, each car usually having two motors for its operation.

I can state on positive authority that the Westinghouse Electric and Manufacturing Company is regularly manufacturing and selling the new stopper lamp, and has been doing so for some time.

On one of the streets in Pittsburgh a steam railway track runs parallel with the South Side trolley line. When a freight train is backed along this track a brakeman stands on top of the first car and rings a dinner bell with such gusto that you expect to hear him yell "Twenty minutes for dinner!" In the meantime the large and handsome trolley cars slide by the freight train at a rapid gait and give intensity to the odd comparison.

That part of the State of Indiana in the vicinity of Indianapolis, viewed from a window of a pleasant parlor car of the great Pennsylvania Railroad system, looks like a big birthday cake covered with sugar and candy trees. Everything is snow-bound, and every twig on every tree is white with sticky snow. It's beautiful, but hard on the eyes.

The Citizens' Street Railroad Company, of Indianapolis, is hustling its trolley cars right along in spite of the snow, and the rapid transit service booms merrily. There is some of the best overhead construction on the trolley lines in this city that I have yet seen. The curve construction is especially light, graceful and strong.

While I was waiting for a trolley car in Indianapolis, the other day, I saw quite a number of people enter a large yellow car on Washington street, near Illinois. Some of the people got out again and others got in, but the car didn't move. A closer inspection showed me that there were no horses attached to the car. I could discover no trolley arm, and as there was no cable slot in the street, I decided that the car was not meant to go, but was planted there to stand still. It proved to be a waiting station for transfer passengers, and the idea of using an old car for this purpose struck me as a good one.

Mr. R. T. McDonald, general manager of the Fort Wayne Electric Company, was in Indianapolis the other day trying to secure a street railway franchise. The Board of Public Works is very favorably disposed towards Mr. McDonald's proposition to build a line from Indianapolis out to Broad Ripple.

Mr. McDonald said: "You may depend on it that I am going to build that line out there if I can get a franchise. Everything looks favorable for it now. The board and members of the Council that I have met give me reason to believe that I will not be disappointed."

"Is there any truth in the assertions that you are connected in this deal with any Eastern syndicate, or that other capitalists than yourself are interested in it?" was asked.

"Let me deny that again, as I have already done. It has been stated that I am in collusion with either the Widener-Elkins or the Vernon-McKee firms, but I do not even know them, except by reputation. I will build the road myself, and then I expect to sell my securities. If these people buy them I am perfectly willing that they should, but they will be bidders in the market on the same footing with any one else. The Thomson-Houston people are interested in it just to the extent that their apparatus will be used, as I consider it the best made."

The Commercial Electric Company, of Indianapolis, is one of the younger manufacturing companies in the field which gives promise of becoming an important factor. They have a well equipped shop and are making a dynamo and motor which have special claims for efficiency and good service. Over 60 machines have been built and shipped on order within the past 60 days. Mr. Hadley, in charge of the manufacturing department, and Mr. Adams, the general manager of the company, were both formerly connected with the Jenney Electric Motor Company and consequently are gentlemen of experience.

ST. LOUIS PICKINGS.

On the train going from Indianapolis to St. Louis I met an electrical engineer of my acquaintance who told me that several months ago representatives of the General Electric Company secured samples of the new Westinghouse lamps and that they had been testing them ever since. My informant stated that this news had come to him from two perfectly reliable sources and that he believed it to be so.

The American Electric Manufacturing Company, of St. Louis, manufacturers of incandescent lamps, shut down their plant on Saturday, January 21, and are now cooling their heels while awaiting the pleasure of the General Electric Company. Papers were served on the American Company by the General Electric Company, which contained technical errors, recognition of which by the courts would have given the former a short respite. But Mr. Nahm, the general manager of the company, thought the wisest policy was to capitulate, and so operations were suspended.

The unexpected defense of the Beacon Vacuum Pump & Electric Company, of Boston, against the petition for an injunction by the General Electric Company, and the refusal of the court to grant an injunction, were known in St. Louis, through private telegrams, on Wednesday evening, January 25, and created much comment. The Geobel processes were unknown to electrical people here prior to their appearance in this suit, and everybody thinks it strange that they have not been heard of before during the lamp litigation.

Mr. Lemuel Bannister, the general manager of the Westinghouse Electric & Manufacturing Company, will probably read a paper before the convention of the National Electric Light Association, in which he will fully describe the new Westinghouse lamp.

Dr. Wellington Adams, projector of the Chicago-St. Louis Electric Railway (100 miles per hour), has returned from Washington, where he has been wrestling with our statesmen to get a bill through which will allow him to import his electrical apparatus duty free. Dr. Adams looked tired out when I saw him at the Electric Club (a promising organization, which I shall speak of at length in my next), but he says the construction of the road is progressing just the same.

STEPHEN L. COLES.

St. Louis, January 28.

Incandescent lamps must be made very cheaply in Sweden; the price of those with all voltages up to 125 is about 20 cents.

The first building in Canada to be heated by electricity is a power house in Ottawa, in which is installed a 33,000 pound generator, the largest ever taken into the Dominion.

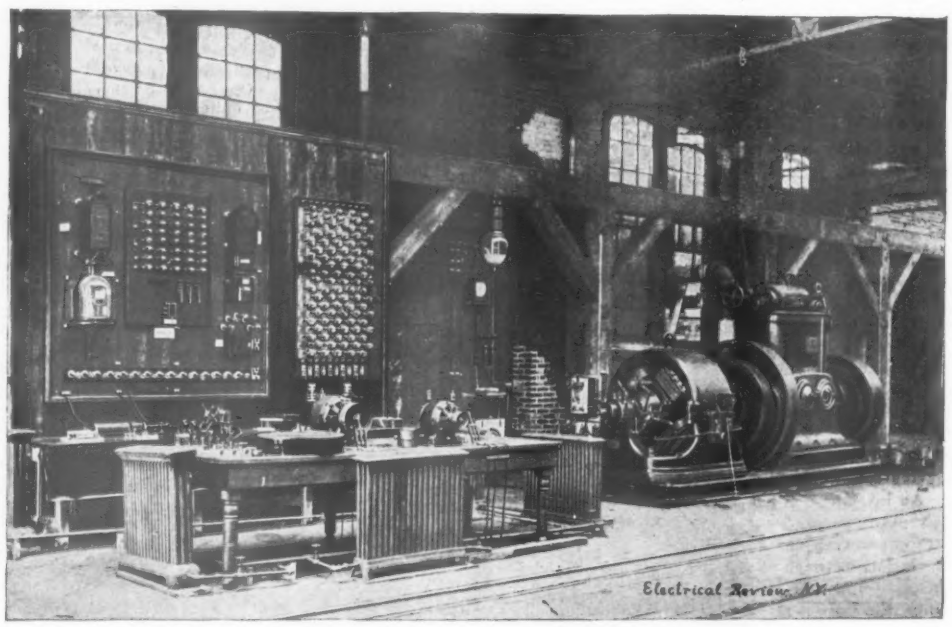


FIG. 2.—EXHIBIT OF THE NEW WESTINGHOUSE STOPPER LAMP AT THE ALLEGHENY FACTORY OF THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.

STILL THE LAMP.

GENERAL ELECTRIC COMPANY'S ATTEMPT TO ENJOIN THE BEACON COMPANY AT BOSTON BRINGS OUT SOME INTERESTING TESTIMONY—NO INJUNCTION YET GRANTED, AND THE JUDGE NOW READING (AND DREAMING) ABOUT THE INCANDESCENT LAMP AND ITS EVER-CHANGING HISTORY—INVENTOR GOEBEL WITHOUT A SINGLE PATENT TRYING TO KNOCK OUT EDISON WITH MORE PATENTS THAN ANY LIVING MAN—THE STORY OF THE HEARING—A VISIT TO LEGAL HEADQUARTERS OF THE DEFENSE—GOEBEL'S AFFIDAVIT, ETC.

The incandescent lamp question will not down. This graceful little pear-shaped bulb, with its soft, soothing, light-giving properties, is becoming unique in the history of invention. The trouble Japhet had in hunting up his father is not to be compared to the exasperating delays the orphaned incandescent lamp has encountered in definitely locating the author of its being.

The Supreme Court of Appeals said it was Edison. This was after some 12 years' investigation of the claims of other would-be parents.

The Beacon Vacuum Pump and Electric Company, of Boston, claim that the lamp was invented, but never patented, by Heinrich Goebel, a German, of New York City, in 1850, while Edison was still in knickerbockers. And they proceeded to back up the assertion by a number of plausible affidavits.

The defense in this instance, has been ably, not to say dramatically, handled, and the outcome will be awaited with much interest.

The judge is to receive the printed testimony, briefs, all fresh affidavits, etc., on Wednesday of this week and will then, no doubt, take a few days off, or possibly weeks, to study the question.

The Edison people claim that the "bomb shell is only a fire-cracker," and that the Goebel claim had been submitted to them and turned down a long time ago. Like Banquo's ghost, it did not remain down—in fact, like the genie that came out of the fisherman's jar, it has expanded and, under skillful legal and executive management, has assumed proportions that no one anticipated.

There is some very energetic work going on in electro-legal circles just now. Meanwhile, Herr Goebel patiently waits and watches under the care of the very ingenious and resourceful chief attorney for the defense, Mr. W. C. Witter, of New York.

Incandescent Lamp Litigation—The Boston Case.

After three days of protracted argument, the case of the General Electric Company against the Beacon Vacuum Pump and Electric Company, which has been the source of so much speculation in electrical circles, was brought to a temporary close on Wednesday night, last week, in the U. S. Circuit Court, by Judge Colt granting the defendants an adjournment of one week in which to have printed the voluminous testimony and additional briefs filed. The case, so far as it has gone, has proved a surprise to many. From what has already transpired in this famous litigation, the majority looked for an outcome similar to that by which several other large lamp manufacturies of the country had been obliged to close their doors, and the plaintiffs themselves, while naturally strengthened in their position by the previous decisions rendered in their favor, and having, it would appear, the case entirely in their own hands, were hardly prepared for the vigorous resistance offered, which aimed not only to prevent an injunction being granted, but attacked the validity of the Edison patent in its most vital part, claiming that another inventor, entirely unknown to fame, and until the present time in no way connected with the parties to the litigation, had made, used and exhibited an incandescent lamp fulfilling all the requirements and commercial uses of that of the present day, at least 20 years before the Edison lamp was put upon the market.

The case was first called for preliminary hearing on Monday, January 16, the plaintiffs being represented by T. P. Fish, R. N. Dyer, and Clarance A. Seward, and the defendants by W. C. Witter and L. D. Brandeis. The plea for an immediate injunction was denied by the court, and the defendants were given a week in which to prepare their affidavits, and the new testimony which they claimed to be able to put in evidence. Accordingly, on Monday, January 23, the case again came up for hearing, and upon the opening of the court at 11 A. M. the plaintiffs asked for an hour's time in which to look over the affidavits to be submitted by the defense. This was granted.

At 12 o'clock Mr. Dyer opened the case for the plaintiffs by rehearsing briefly the history of the litigation carried on for over seven years by the Edison Company in their efforts to sustain their patent, and the decisions which have been already rendered in their favor. He also pointed out to the court how much depended upon the result of the present case, as in the event of their failing to obtain an injunction in this instance, it would virtually mean the reopening of the entire matter, and nullifying to a great extent their previous verdicts by opening up new ground on which to contest their claims, and keeping the matter before the courts until such time as the patent had expired, thereby making it impossible for them to reap the benefits to which they were entitled, and for which they had so long contested. In view of these facts, he considered the affidavits of the defendants of little or no importance on the general bearing of the case, and requested the court to grant the injunction asked for by the General Electric Company without further delay.

A recess of one hour was then taken, after which Mr. Witter opened the case for the defendants by taking up the original Edison patent, and endeavoring to show wherein their defense differed from that offered in previous cases, and then proceeded to read the affidavit of Henry Goebel, as from the original inventor of the incandescent lamp, which formed the main bulwark of the defence.

It appeared from this affidavit that, as early as 1855, Goebel, at that time a resident of New York, carrying on the business of a watchmaker and optician in a small way in Monroe street, had made quite a number of incandescent lamps, used them in his store, and exhibited them to a large number of persons in public and at his home, and had experimented in various ways in both incandescent and arc lighting. Three of these lamps in different forms, showing the gradual improvements made in the construction, and which had remained in his possession during all these years, were offered in evidence, and Mr. Goebel stated that the only reason they had not been put to a commercial use by him lay in the fact that at that time no dynamos had been invented to supply necessary current, and that he was limited in this respect to batteries which he himself constructed. This affidavit was of great length and went into the most minute details of Mr. Goebel's life. It was backed up by a mass of testimony from other parties who knew him at that time, and had seen his lamps used and exhibited in public.

Among these were his two sons, J. C. and H. Goebel, Jr., Horace E. Van Ranst, Nicholas Finck, Geo. G. Crosby, Jacob Fey, Celestine West, daughter of Mr. Goebel, Mrs. Nicholas Finck and others; affidavits of Franklin L. Pope, patent expert, and Prof. C. R. Cross, of the Massachusetts Institute of Technology, supporting the claim as experts on the question of the similarity of the Goebel lamp to the Edison lamp.

The reading of this evidence occupied the attention of the court on Tuesday and during the forenoon of Wednesday, after which the case was summed up by Mr. Dyer, Mr. Fish and Mr. Seward. Mr. Witter, for the defense followed, in a long and very able summary, in which every phase of the matter was taken up and commented upon at length. The court then adjourned, to re-assemble on Wednesday morning, February 1.

The present suit differs materially from those which have gone before in the fact that the evidence is entirely on a new line. Judge Colt has given it his full consideration from the start, and while, of course, it is impossible to say what the decision will be, there are many grounds for expectation that new developments may be looked for at the next session of the court, and that possibly a new trial will be ordered.

Boston, January 28. H. G. T.

The Solemn Oath of Heinrich Goebel.

In the affidavit of Heinrich Goebel, who sprung into prominence through his connection with the suit for injunction before Judge Colt in Boston, he declares that he was born in Germany in the year 1819. Professor Moenighausen, a scientist who patronized his watch-making establishment, had often conversed with him about the feasibility of the plan of constructing an electric light, by utilizing a carbon conductor placed in a vacuum and heated to an incandescent condition by the passage of an electric current. In the year 1848 he came to New York and he continued at his business, that of watch-making, at his home in Monroe street until 1868. Professor Moenighausen's ideas had taken firm root in his mind, and in the early fifties he attempted to put them into execution; he made a number of incandescent lamps of glass tubing containing filaments of carbonized bamboo and tampico. His leading-in wires were of platinum, copper or iron, and they were fused into the tube. He used a Torricellian vacuum, and hermetically sealed the lamp by fusion. During the time between the years 1855 and 1881 he made many of these lamps, and always had a number of them in his rooms, and, using a battery of about 30 zinc-carbon cells, he lighted his shop. During the year 1859–60 he travelled around with a large telescope of his own manufacture, and on the same truck with it he had two or three of his incandescent lamps, which he used as an advertisement to attract the attention of the pedestrians.

HEINRICH GOEBEL.

Several of these lamps were put in as exhibits, and are more or less in a dilapidated condition.

In the Camp of the Defendants.

On the eighth story of the Potter building, No. 38 Park Row, N. Y., are situated the law offices of Messrs. Witter & Kenyon. These gentlemen are now engaged in arranging the evidence presented in the injunction suit by the General Electric Company *versus* the Beacon Vacuum Pump and Electric Company, of Boston.

In view of the apparently startling and unlooked for evidence, it can be well imagined that the defendants are in a feverish state of excitement.

There is no such thing as a little enemy. It is also asserted that it is the unexpected that always happens. Considering the importance that is laid upon this new feature in this injunction suit, it might prove interesting to know what the defendants think about their chances for success. With this end in view, a representative of the ELECTRICAL REVIEW paid a visit to the law offices of Messrs. Witter & Kenyon.

"Is Mr. Witter in?" was asked of one of the numerous clerks in the office. "That depends entirely on who you are," replied the clerk. "Please be kind enough to tell Mr. Witter that the ELECTRICAL REVIEW would like to have a word with him."

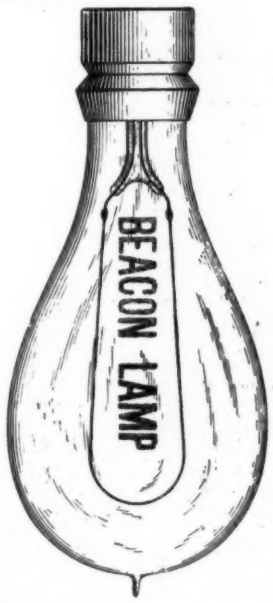
The young man disappeared, and during the very brief interim that ensued a general survey of the office sufficed to show that the entire corps of clerks was absorbed in the case. Stenographers to the right, clerks dictating to the left, and like shots from a Gatling gun could be heard the words "Goebel," "prior invention," "incandescent lamp," etc. Everything was hurry, and a busy, eager, important look was on the face of every clerk.

Shortly the clerk appeared and said: "Mr. Witter will be pleased to see the representative of the ELECTRICAL REVIEW."

The door to Mr. Witter's private office was opened, and that gentleman was seen pacing up and down the room dictating to a stenographer. Seated low down in a chair near a corner was an old gentleman who was answering questions which were being put to him by Mr. Witter. It is very possible that if any one had been a shrewd guesser, and had said that the stout bright-eyed old man was Mr. Goebel, I think that he would not have been far from wrong. However, Mr. Witter turned as I entered, and in a pleasant manner asked: "What can I do for the ELECTRICAL REVIEW?" and without waiting for a reply he continued: "You see I am very hard pressed for time. Judge Colt has given us only a week to prepare our briefs, and every moment of my time is very valuable."

"Have you any additional drawings or testimony?"

"All that we possess has already been shown, and we are simply getting our matter into shape."



"Have you any more of the Goebel lamps, and are any that you have perfect?"

"As I said, all the lamps that we have have been exhibited. No, we have no perfect lamps. They are all somewhat cracked."

"As should be expected," interjected the bright-eyed old gentleman.

"Yes, certainly," added Mr. Witter, "as should be expected."

"Do you think the Judge will reserve his decision."

"I have no doubt but that he will."

The stenographer cast an appealing look into Mr. Witter's face. Suddenly, Mr. Witter said:

"I hope you will not think that I am trying to cut you short. Had I the time I would like to have a long talk with the REVIEW.'

"I see that you are, indeed, very busy; good afternoon."

Mr. Witter continued to pace to and fro, the bright-eyed old gentleman settled further down in his chair, the stenographer continued writing his notes more rapidly than before, and as I passed through the outside offices, "Goebel," "prior invention," "incandescent lamp," again fell upon my ears. J. A. M.

The Beacon Vacuum Pump and Electric Company, of Boston, although comparatively new in electrical circles, is an organization of strength, backed by men of means and determination. A large factory in Boston is devoted to the manufacture of incandescent lamps, where, until the latest announcement of the Westinghouse Company, improved processes enabled the Beacon Company to manufacture the cheapest lamp on the market, the quality of which, we believe, ranks with the best. To alert General Manager Kaliske is generally attributed the sudden bringing forward of the Goebel claim, which so startled the officials of the General Electric Company, pointing out a weakness in their supposedly invulnerable armor that they had heretofore declined to consider.

Electrical Recording Meters.

A PAPER READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, JANUARY 17, 1893, BY CARYL D. HASKINS.

(Continued from last issue.)

Those thermo-meters depending upon volatilization of a fluid, generally have two or more sealed bulbs partly filled with some volatile fluid, as for example, naphtha or ether. When two such bulbs are used, they have generally been mounted on a walking-beam mechanism combined with a pole-changer, each bulb containing some kind of a rheostat or heat-developing device dependent for its heat on the current passing through the meter, the two bulbs communicating with one another. The rheostat in but one bulb is in circuit. The heat developed in the rheostat in circuit volatilizes more or less rapidly the fluid contained in this bulb according to the current passing through it. The gas developed either passes in gaseous form into the second bulb and condenses, or else, as is more common, forces the fluid remaining by the simple increase of pressure into bulb No. 2, which at once becomes heavier and causes its end of the beam to fall. This throws the pole-changer, and the rheostat in the second bulb is thrown into action, repeating the operation as just described. To be successful, such a device must be very sensitive, and to be sensitive the construction must be of a more or less expensive character, and so delicate as to be to a greater or less degree prohibitive. Like the walking-beam meters just described, instruments of this class have been designed with a number of bulbs mounted on a rotating wheel, the same actuating principle holding true for all such devices.

Another ingenious form of thermo-meter, no longer in any sense a chemical meter, is an instrument dependent for its action upon the heat in a confined but circulating atmosphere. Thus a rheostat dependent for its heat upon the amount of current passing, is so arranged as to heat a body of air, which, by the peculiar construction of its receptacle, at once commences to circulate more or less rapidly, dependent upon the heat. It is obvious that if a delicate air fan, a screw propeller, in fact, be suspended over such a circulation of air, its speed would increase with the speed and volume of circulation, and one of the most ingenious and most interesting meters that it has ever been my good fortune to see, is the Forbes meter constructed on this plan. But here friction is the most serious consideration—the torque obtained in this manner being necessarily small.

While the Forbes meter cannot, perhaps, be properly considered as a motor meter in the true sense of the word, it still must be classed as such in a certain sense, and I think it may safely be accepted as an axiom, that to be successful in practical operation, a motor meter of any kind must be of high torque, for it is only by the combination of high torque and compensated friction that accurate results can be obtained on light loads. I might say that almost any one can build a meter which will record fairly accurately on heavy loads; the difficulty is to build a sensitive and accurate meter for very light loads down to one lamp.

Another ingenious and quite positive form of heat meter consists of two metallic rods, or in some cases of two bi-metallic rods, somewhat similar to an ordinary thermostat; such meters being in fact a simple application of the thermostat principle to a recording device. Two rods of this kind may be placed vertically, one under each end of a walking-beam mechanism, the familiar pole-changing device being again brought into play to throw the current first through one rod and then through the other. The character of the walking-beam must be such, that only a slight movement is needed to actuate the recording mechanism and also the pole-changer.

The method of operation of a meter of this kind is obvious; the alternate expansion and contraction of the two rods as they are thrown in and out of circuit will occur with a rapidity dependent upon the current passing, and, as each rod lengthens, it throws over the walking-beam onto the shorter cool rod, and the same action follows from that side.

I think no comments are needed on such a device as this; it probably lacks sensitiveness to a marked degree and it has other objections which are sufficiently apparent.

A patent issued in the year 1889 to a Mr. Dahl tells us of another quite unique form of thermo-meter, and this is probably the only heat meter actuated by an actual field and armature arrangement. In this instrument the inventor provides a field of iron excited by a few series turns on the lamp circuit. The strength of the field should therefore bear a more or less definite relation to the amount of current passing through its turns. I will not comment upon how direct this relation would be. It will suffice to say that the introduction of iron in the construction of any meter of this character is probably detrimental to its accuracy to a quite marked degree. This, however, is aside from the subject in hand.

On a shaft in the meter which we are describing is suspended a kind of armature consisting of a flat disk-like ring of iron, supported by a number of spokes and mounted as a wheel; in fact, it is mounted on a quite ordinary shaft mechanism suspended in proper bearings. The iron portion of the wheel rotates between the poles of the electro magnet, or at times permanent magnet just described. We have, in fact, a disk armature rotating in such a manner as to pass between two poles of a more or less strong field. On the principle of the familiar thermo-magnetic motor, rotation is obtained in this meter by so placing coils of wire or other suitable material under certain portions of the disk and in series with the lamp circuit that the disk is differentially heated at the proper point; thus, with the peculiar armature construction described, a thermo-magnetic action is set up, somewhat akin, probably, to the action of the thermo-pile. The portion of the disk heated is attracted toward the field coils, and thus the disk being progressively heated and cooling rapidly owing to its thinness, continuous rotation is set up. Sometimes in this construction the field is in series with the heating device and sometimes the heating device alone is in series with the lamp circuit, and the field is either a permanent magnet or independently excited by a battery. Neither of these changes involve the principle of the meter, which is assuredly ingenious.

I might add here, at the risk of digressing from my subject, that there is probably no known indicating device from the Cardew voltmeter to the Sir Wm. Thomson balance which could not be so applied as to make a more or less accurate clock meter.

The general character of the clock meter has already been briefly stated; that is, we have already defined the character of one form of clock meter. There is almost endless variety of instruments of this kind. They are not all electricity meters by any means; some are recording voltmeters, others recording ammeters and others have still different purposes. The familiar recording steam gauge is only a modification of this instrument. Many such instruments have been designed for station work and for testing purposes where great accuracy and considerable cost of construction was permissible. But these hardly come within the province of a treatise of this kind.

A paper is almost invariably rotated over a drum, sometimes being fixed to the drum, and sometimes being drawn from one drum to another, the paper moving at uniform speed, and generally being divided into hours or other fractions of time by abscissæ lines.

This clock mechanism can be combined with any indicating device; it is only necessary to supply the connection which shall cause the indicator to mark the paper and draw a crooked line. First attempts of this kind are generally made with an ordinary solenoid, or sometimes with a simple coil and iron core rising and falling with the current. Whatever the character of the indicator or method of communication between the indicator and paper, it remained necessary to keep the friction of contact low.

First attempts were made with a pencil bearing directly upon the paper, but the friction introduced by this device was fatal to accuracy. A glass pen has been substituted for the pencil with better results, but even this caused too much friction. The photographic method of line drawing is one of the best systems yet introduced, and is probably more familiar to the majority of us than the other methods, because it forms a component part of the Walker meter which has attracted attention at various times.

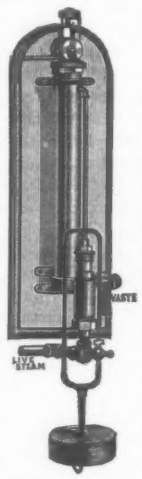
With an instrument of this kind a diaphragm is provided, attached to the indicating mechanism and raising and falling with the variations of the indicator. Through this diaphragm is a small aperture, the best plan being to form this aperture by the crossing of two slits in two diaphragms. Through this small hole light from a burning lamp is shed upon sensitized paper with the result already described.

One of the best methods of accomplishing the registration, perhaps, when all things are considered, the very best, is to attach to the pointer of the indicator a steel point or needle with an iron armature mounted in the form of a spring, or in some similar manner. By placing an electro-magnet behind the paper to be marked, and sending through this magnet an electrical impulse at fixed periods of, say, one, two or five minutes, the pointer is drawn sharply down to the paper, puncturing it, and is immediately released by the cessation of energizing current in the electro-magnet. Thus, the paper when removed will have a continuous marking of punctures tantamount to a curved line. This device presents practically no friction, and is more or less simple and easy to carry out. The make-and-break necessary for the electro-magnet is easily actuated by the clock movements. But we may say of these forms, as well as of the forms of clock meter which are to follow, that there is one serious objection to them all—they have to be wound up, which is certainly a fault. We may modify this statement by saying that many of these devices have an electrical attachment which makes them self-winding, and this is a step in the right direction at least. Whether it fully meets commercial necessities, is, I believe, an open question.

(To be continued.)

Davis Automatic Damper Regulator.

A very compact and neatly constructed damper regulator, manufactured by G. M. Davis & Company, of Chicago and New York, is shown in the accompanying illustration. With this damper regulator there is but one connection to the boiler and there is no water connection whatever. Experiments have shown that by its use a saving of from 7 to 15 per cent. of fuel may be had. The apparatus is highly nickeled and mounted on a finished board. But one size is manufactured, as this answers all conditions.



The valve is weighted to the desired pressure, the normal position of the damper being open—held open by a weight on arm. When the pressure in the boiler arrives at the set point, the valve is forced up, opening the steam ports and admitting steam at boiler pressure under the piston inside of the cylinder, forcing it up and closing the damper by means of the cord or chain run from the end of the piston rod under the pulleys and connected to the damper arm. This position is maintained until the pressure falls one pound, when the weights bring the valve down, closing the live steam ports and opening the exhaust ports. The amount of condensation passed by waste pipe will seldom exceed a pint in every 24 hours.

The connections are very simple, and, if proper care is taken in cleaning, the regulator need never get out of order.

The Mining Department of the General Electric Company.

The mining department of the General Company has extended its business very rapidly during the past year. Their electric locomotives have met with great favor. Among numerous letters of commendation, the one below is particularly satisfactory, as it calls attention to the emancipation by electricity of that long-suffering and patient animal, the mule:

ARNOT, TIOGA CO., PA., Dec. 20, 1892.

General Electric Company, Mining Department, 620 Atlantic Avenue, Boston, Mass.:

DEAR SIRS—In reply to your favor of the 17th inst., I would say that the two 30 horse-power T. M. M. electric locomotives which you furnished for our Bear Run mine are each delivering daily to the head of plane 300 tons in eight hours. Owing to the fact that the mine is only partially opened, we are, as yet, unable to get as much coal as the machines could handle. I have no doubt that they will easily haul 500 tons each per day of ten hours. One of them works on the right, the other on the left hand side of the main heading. They go down into the cross-headings, distribute the empty cars and collect the loaded ones, and very efficiently take the places of the mules we formerly used. The work they do is very satisfactory. Our largest haul at present is 3,000 feet; shortest, 1,700 feet.

The three horse-power stationary motor at the foot of our inclined plane receives its current from the power house at the head of the plane, a distance of about 1,300 feet. It is used on the empty car transfer, and has proved very successful. This motor drives a sprocket chain which handles 500 empty cars daily over an incline 30 feet long, of 10 feet vertical rise, and if kept busy would, no doubt, handle 800 cars per day of ten hours.

In regard to the D 32, 35 horse-power generator which you furnished this company in February, 1892, I have nothing for it but commendation. It has required and has received no repairs whatever, excepting the renewal of brushes when worn out.

It affords me pleasure to testify to the success of the plant you have installed for us.

Yours truly,
R. T. DODSON,
Supt. Blossburg Coal Co.

Advance Electrical News from Europe.

A NEW SUBMARINE BOAT.

A trial has just taken place at Civita Vecchia of a new submarine boat invented by Degli Abati, and which is operated by electricity. Considerable interest has been manifested in the experiment and, in addition to a distinguished assembly, the Italian government sent two naval officers to witness the test. The boat, which is called "L'Audace," was built at Savona, according to the designs of the inventor. She is 28 feet long and 8 feet wide, and is said to have the peculiar depth of about 11 feet, the total weight being 40 tons. The special advantages claimed for this boat over all others are the length of time it can remain under water (48 hours) and the depth to which it can descend (130 feet). These claims were, however, not borne out at the trial, which was brought to a speedy termination through an accident. The boat was towed out of the harbor to a spot where the water was 130 feet in depth, and no less than 20 minutes were occupied in causing the boat to sink immediately below the surface of the sea. The boat then sank rapidly, as was shown by the paying-out cable connecting the submarine boat with the launch, to a depth of 50 feet, when the signal for an immediate ascent was received by the launch, and 20 minutes after the boat disappeared she was brought up to the surface. The rapid descent was due to some inexplicable cause, whilst the son of the inventor had one of his hands crushed in the gearing. It was, of course, not intended that the boat should sink quickly, and in future experiments the inventor is sanguine that such a *contretemps* will not recur.

ELECTRIC TRACTION.

Once again has that interesting body—the Tramways Institute of Great Britain and Ireland, to whose proceedings reference has previously been made in these columns—met to consider the subject of traction on tramways. The assembly took place in Birmingham on December 30, under the chairmanship of Mr. W. J. Carruthers Wain, the English tramway king. At first a discussion took place on a paper read at a previous meeting dealing with the construction and maintenance of the permanent way of tramways; but the real object of the assembly was to receive a paper by Mr. A. Dickinson, descriptive of the electric tramway lines of the South Staffordshire Tramways Company, Limited. This company, it must be mentioned, have about 32½ miles of lines, and eight miles of this system, hitherto operated by steam cars, have now been converted into an electric line. The overhead trolley system has been introduced and the plant and cars were set in operation on the last day of 1892 in the presence of a distinguished assembly and the members of the Tramways Institute. Space will not at present allow of a lengthy description of the installation, but the following salient features will be of interest. The lines connect together the localities known as Wednesbury, Walsall, Daralston and Blowich, and the generating station is arranged about the center of these lines. It contains three Lancashire boilers for a working pressure of 120 pounds, and three compound condensing engines, each of 125 indicated horse-power, which drive the dynamos by means of ropes. The dynamos are of the Elwell-Parker type, and are three in number; they each give 250 amperes at a pressure of 350 volts when driven at a speed of 450 revolutions. A feeder cable is carried out from the generating station, and is laid underground 15 inches below the street level, so as to feed the trolley wire near to the heaviest points on the line. The connections are made to the trolley wire every half mile by means of branch distribution boxes. From each of these boxes are laid two cables, which are carried up inside the pole and along the arm which supports the trolley wire, and are connected to the line breakers which divide the trolley wire into half mile sections. Special arrangements

are provided at the turnouts or points. The poles carrying the trolley wire are light, and are placed at the side of the footpath. The number of cars in use is 16, and each will accommodate 40 passengers—22 inside and 18 outside. Each car is fitted with two single reduction motors of 15 brake horse-power, one being coupled to each axle by means of steel helical gearing wheels running in oil in a dust-proof case. There are two brakes to each car, a lightning arrester and controlling, reversing and motor switches. The trolley or collector has to make an uninterrupted bridge through the

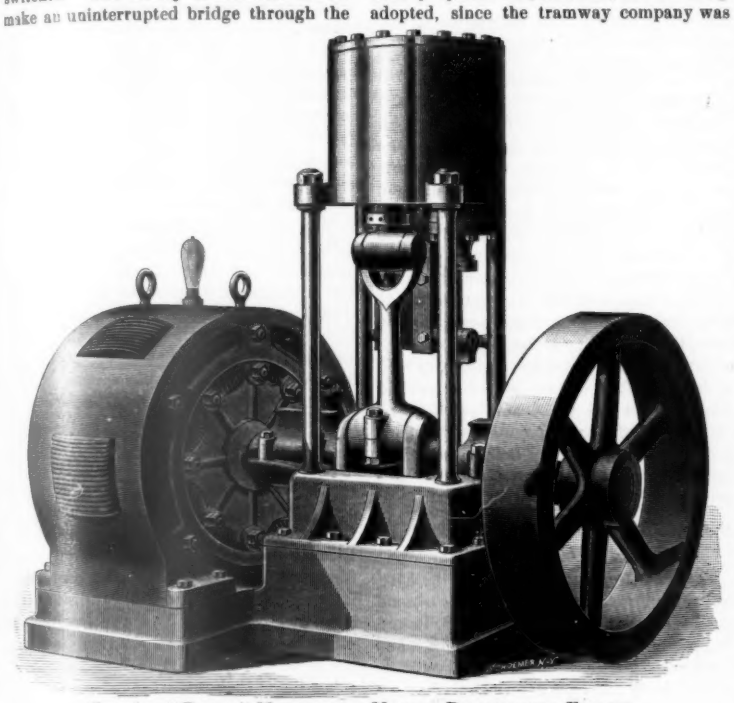


FIG. 1.—"RIKER" MULTIPOLAR MARINE DYNAMO AND ENGINE.

constantly varying space between the car and the trolley wire. This necessitates a vertical and a horizontal movement, and this Mr. Dickinson found could be obtained by combining a radial movement in a telescopic trolley stand with a hinge or bell crank movement on the trolley mast itself. In fact, this arrangement forms what the trolley practically has, namely, a universal movement. The trolley mast is 13 feet long and is made of very light taper steel tube, with the trolley fork at the small end and the bell crank at the larger end. The latter is pivoted in a jaw upon the trolley stand. The trolley wheel is kept up against the wire by means of six coil springs pulling the short arm of the crank down towards a saddle upon the trolley stand, to which they are connected. The trolley itself is a small brass wheel, with flanges very similar to a rope pulley, and runs in a wrought steel frame with guards upon either side. The frame terminates at its base in a spindle which drops into a vertical bearing upon the end of the trolley mast. This gives the wheel and frame a free radial movement to adjust itself to the wire apart from any horizontal movement of the trolley mast. In other words, the trolley stand forms the center from which the trolley itself can, in its movement upon the wire, describe a circle of 26 feet in diameter. The rails form the return circuit. It will be evident that this arrangement of the trolley is probably one of the most important features of the system, and, as such, is in advance of even American practice. Although only the second line on the overhead system of collection in this country, it will, doubtless, tend to further progress in this direction.

BERLIN ELECTRIC RAILWAYS.

The projects for the construction of electric railways in Berlin, on the lines of the City & South London Electric Railway in London, and the elevated railroad in New York, do not appear to assume any definite shape, and for that matter, two considerations which the town council of Berlin have laid stress upon in the different negotiations with those interested have been the practicability and possibility of raising the necessary capital. Confirmation of this statement is to be found in a report of the "municipal architects deputation" for the year ending last April, and only now issued at the end of December. It appears that after investigating the working of the electric railway at Buda-Pesth, a deputation on behalf of the Berlin municipality approached the Greater Berlin Tramway Company, with a view to the latter laying down of an experimental line on the open conduit system so ably carried out at Buda-Pesth by Messrs. Siemens & Halske. This proposal was, however, not definitely adopted, since the tramway company was about to conduct experiments with secondary battery cars, but, for all that, these cars have not yet appeared. About that time Messrs. Siemens & Halske brought forward schemes for the erection of elevated electric railways and the General Electricity Company, (Allgemeine Elektricitats Gesellschaft) for underground lines. It was then suggested to the former that they should establish an experimental line so as to demonstrate the practicability of the system they proposed to employ. That was the position in April last, and that is how the matter stands to day at the beginning of 1893. The railways projected by that firm alone were, (1) from the East to the West; (2) from Friedrickstrasse to Grunewald, and (3) Friederickstrasse-Gesundbrunnen-Pankow. So far, German financiers have not given to this class of electrical engineering the same support which they have to other electrical undertakings; they are doubtless awaiting developments in England and the United States. A. W.

London, Jan. 21, 1893.

Mr. Benton, of Massachusetts, presented to the State House a petition for a law that no street railway which uses electricity as a motive power shall cross a steam railroad at grade without the consent of the railroad commissioners.

Electrical Apparatus for Marine Use.

In no single branch of electrical work has there been a more satisfying introduction of electrical apparatus than that on board ships and yachts. The superiority of the incandescent lamp over oil and other illuminants is self-evident. Its entire freedom from dirt and danger, especially when the cargo is inflammable, and the saving in labor over that consequent upon the use of oil, are all practical advantages which its extensive use has shown are fully appreciated. The ease with which the lights can be controlled from one and any position, and their adaptability where the use of oil would be unsafe or impossible, by reason of being affected by wind, water or violent motion among the machinery, are advantages worthy of consideration.

The illustrations we present in Figs. 1 and 2 are combinations now being installed by the Riker Electric Motor Company, of Brooklyn, N. Y. Mr. Andrew L. Riker, the president and electrician of the company, has always been interested in yachting, and in this direction his fancy naturally turned immediately after bringing out his varied and ingenious electrical inventions. Though quite a young man, Mr. Riker's work has already attracted wide attention, and the REVIEW is pleased to present to its readers some of his latest productions.

These combinations illustrated show the dynamo and engine both on the same bedplate. That on Fig. 2 includes plants up to 75 lights in which the engine and dynamo shafts are rigidly coupled.

From 100 lights and upward the armature is attached directly to the engine shaft. In yachts or where room is limited, the saving in floor space of these plants over a belted plant is a strong recommendation.

The engines are light and especially designed and the dynamos of low speed. These combinations are as shown a marvel of compactness and lightness, and are said to show a higher efficiency, weight, speed and dimensions being considered, than any others in the market.

They are finely finished and the engines are the smoothest running obtainable, and, though light, durability has not been sacrificed.

In Delaware the farmers have signified their willingness to give the right of way for the trolley line through their properties free of charge. There seems to be no doubt but that the road will be started early in the spring.

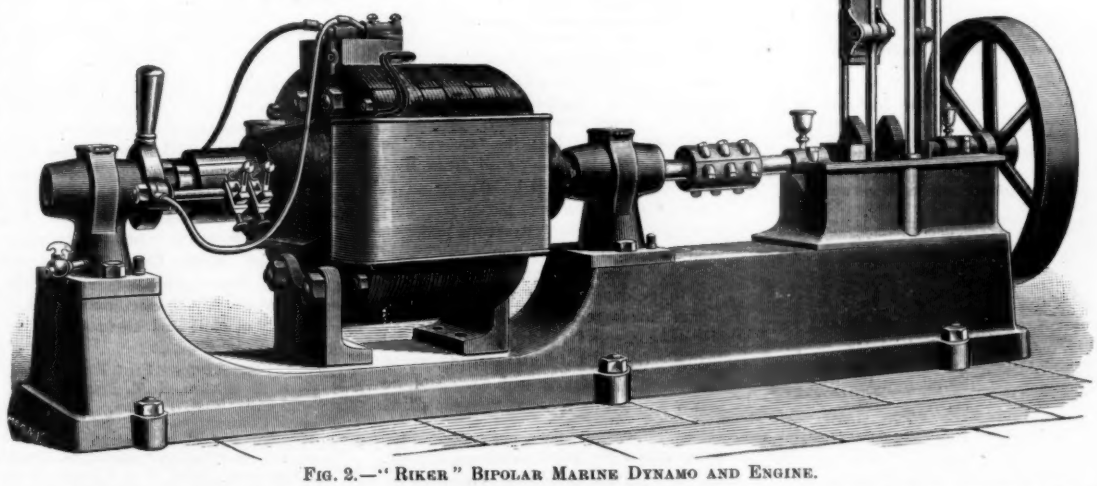


FIG. 2.—"RIKER" BIPOLAR MARINE DYNAMO AND ENGINE.

And the Other Fellow Cusses the Instrument.

"I like to do my quarreling over the telephone," said Hicks. "Then I can always have the last word."

"How do you manage it?"

"I say it, and then ring off."—*Truth.*

The electric cars are now running on the Jersey City and Hoboken branch of the North Hudson County Railroad. The trip from the Bergen avenue terminus to the Hoboken Ferry, a distance of two and a half miles, can be made in from 20 to 25 minutes.

TELEPHONE NOTES.

The West Chester, Penn., borough is about to adopt a telephone fire alarm system.

The Central District Telegraph Company, of Pittsburgh, will establish a district telephone exchange in lower Allegheny at once. About February 10 the exchange will be ready for business.

The Bell Telephone Company has just completed a metallic circuit between Belleville and Picton, Ont. In the spring the company contemplates constructing a similar line to Toronto.

At the annual meeting of the West Fairlee, Thetford and Fairlee Telephone and Telegraph Company, of St. Albans, Vt., a dividend of 10 per cent. on the capital stock was voted, payable February 1, 1893.

The telephone linemen who have been in Decatur, Ill., since last August have left for Peoria. Since that time they have done $16,000 worth of work on the line. It is estimated that the cost of the work to be done in Peoria will amount to about $40,000.

The telephone line between Little Rock and Pine Bluff, Ark., has been completed by the Southwestern Telegraph and Telephone Company at a cost of $10,000, and is open for business. It is a metallic circuit, and the rate between these two cities will be 40 cents for five minutes' conversation.

At a recent meeting of the stockholders of the Winnepesaukee Bell Telephone Company it was voted to sell to the New England Telephone Company. It is understood that the company will receive $6,000 for their business, and thereby realize a cash profit of $3,200 on the original investment of $2,800.

At the preliminary meeting for organizing the Vermont Telephone and Telegraph Company, in Montpelier, Vt., A. C. Brown was elected president, R. G. Brown, of Minneapolis, Minn., vice-president; J. G. Brown, treasurer, and Dr. A. C. Bailey, secretary. The completion of the organization was postponed, pending the adoption of by-laws and transfer of property to the company.

The provisions of a proposed act to limit the charges of telephone companies in Pennsylvania, which was introduced into the House at Harrisburg by Senator Crouse, are to forbid corporations charging a greater amount than $6.50 per month for the use of a single telephone and lines connected with one central exchange, by a single individual or firm, or more than $5.50 per month each for two or more instruments within a radius of two miles of the exchange, and $1 per month for each additional mile. There is also a clause prohibiting discrimination in favor of any class of customers, and a penalty of $500 to be inflicted for any violation of the law.

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Morrison, Geo. H., indicators	v
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If it should turn out to be only a "firecracker," even as fire-crackers go it is, in the language of Poet Eugene Field, a "corker."

It is now thought that the fare for the round trip over the trolley road from Buffalo to Niagara Falls will be 50 cents, or at the rate of about one cent per mile. This low price will doubtless attract the majority of sightseers to the trolley line.

We think every reader of the REVIEW will find this issue of special interest. Its table of contents is comprehensive and valuable. Read it through carefully, every one; you will then agree with us. And the REVIEW will grow better as the year grows older.

Now that a new rule has sprung into existence in Chicago, prohibiting conversation between operators in the central office without first securing the manager's permission, the wicked subscriber declares that the same rule seems occasionally to apply to the telephones!

Our esteemed contemporaries are "mixing up" one another on mistakes in World's Fair pictures, diagrams of space allotments in the Electricity Building, etc. Listen to our voice of wisdom, enterprising yet inaccurate esteemed contemporaries, and don't be precipitate in these matters. The Fair will be with us a long time, and at the beginning, and always, it is better not to know so much that isn't so.

A member of the REVIEW's staff is swooping down on several unprotected communities to the West. Like all true editors, his faculty of observation is with him all the time, and some of the things he saw and some of the things he heard are told to REVIEW readers on other pages in this issue.

The city council of Greenville, Tex., is considering whether or not to sell the municipal electric light plant and apply the proceeds to paving the streets. Keep your light plant, brothers, unless it's a white elephant, and the brilliant arc light will lead you safely through the quagmires of unpaved streets. You will thus have your cake, and eat it, too.

A young woman employed by the Chicago Telephone Company was robbed by footpads in the street. The story got into the papers, and it is claimed that because the young woman refused to tell who gave the reporters the facts she was discharged. The surface facts show this to be an unwarranted proceeding on the part of the telephone company, and we hope the young woman will raise a rumpus until she is reinstated. If a Chicago young woman cannot be robbed by footpads and then tell about it without losing her position, as well as her valuables, things have come to bad ways. It is the inalienable privilege of every Chicagoan to be garroted and robbed and to tell about it, too. It is no part of an employer's rights to interfere with this privilege.

HO! FOR ST. LOUIS, YE ELECTRICAL TOILERS!

Eastern delegates and visitors to the Electric Light Convention at St. Louis should at once communicate with Mr. C. O. Baker, Jr., master of transportation. The demand for accommodations on the special train is, at this early day, quite pronounced, and a large number will assuredly start from New York. The convention will undoubtedly be a most important one, as new questions affecting every local lighting company will be discussed, in addition to a strong programme of papers by able, practical authors. The promise of the presence of that always interesting inventor and lecturer, Nikola Tesla, though secured through considerable sacrifice on his part, is a particular source of congratulation, and elaborate arrangements for the proper presentation of his lecture have been made. Every practical electric light man desirous of keeping abreast of his work should be at St. Louis, February 28 and March 1 and 2.

THE COMMITTEES OF THE ELECTRICAL CONGRESS.

At the meeting of the advisory council of the Chicago World's Congress of Electricians, four committees were decided upon to take up the active work in connection with preparations for the congress. These committees were, the finance, three members; executive, five members; invitations, five members, and programme and papers, eight members. Dr. Elisha Gray, chairman of the advisory council, has now selected the following members of these committees from the advisory council and his local Chicago committee:

Executive Committee—Prof. Elihu Thomson, Enos M. Barton, G. M. Phelps, F. S. Terry and Prof. B. F. Thomas.

Finance Committee—B. E. Sunny, Prof. E. J. Houston and W. A. Kreidler.

Programme and Papers Committee—Prof. H. A. Rowland, Prof. H. S. Carhart, Carl Hering, A. E. Kennelly, Prof. W. A. Anthony, Prof. F. B. Crocker, Prof. E. L. Nichols and Prof. T. C. Mendenhall.

Invitations Committee—T. C. Martin, Dr. Louis Duncan, Prof. C. R. Cross, T. D. Lockwood and C. H. Wilmerding.

Of all these committees, and any others that may be formed, Dr. Elisha Gray is a member *ex-officio*. He will participate actively in the work of each. It is proposed to establish headquarters for the congress at Chicago at an early date, at which Mr. R. W. Pope, the secretary of the American Institute of Electrical Engineers, will probably be stationed to carry on all the detail work in conjunction with Prof. H. S. Carhart, the secretary.

ANOTHER CLAIMANT FOR THE INCANDESCENT LAMP.

Another claimant for the honors with which the highest courts have recently crowned Thomas A. Edison as the inventor of the incandescent electric lamp has loomed above the horizon. He appears in the person of Heinrich Goebel who is represented as an ingenious scientific mechanician who came to this country in 1848, and carried on a business of repairing watches and devoting what leisure he could find to scientific experiments. It is claimed that Mr. Goebel, who is now upward of seventy years of age, had incandescent lamps provided with high resistance carbon filaments mounted on conducting wires leading into all glass vacuous globes in use before the late civil war, a time when our national cradle of liberty was rocking violently on its foundations and long prior to the date when Mr. Edison's cradle of genius began to rock.

Mr. Goebel is represented as a simple-minded German-American, who knew better how to triumph over scientific difficulties than how to size up the commercial value of a pioneer invention. It is said lamps almost exactly counterparts of those now in general use were used by him to attract the attention of passers-by in Union Square, this city, before the war, where he was wont to give nightly exhibitions of the heavens by a telescope of his own make. His claim to the laurels which wreathe Mr. Edison's crown is being urged in Boston by the Beacon Electric Company, which the General Electric Company has sought to enjoin in the manufacture of lamps, and a number of interesting affidavits have been filed, sworn to by members of Mr. Goebel's family and others who saw him make and use the lamps at that early date. It is difficult, at this stage of these surprising developments, to forecast the result of the question thus raised.

It is asserted by Mr. Eaton, of the Edison Company, that Mr. Goebel's claims were brought to his notice as early as 1882, and that after investigation they were ignored as lacking substantial foundation. It seems strange that an event of such great interest and importance should not have met wider notice at the hands of the omnipresent and astute reportorial quills of the great metropolis; and it seems strange, also, that the great interests back of Edison should invite, by the slur which was put upon Goebel's claims, a hostility which might so vitally endanger their enterprise. It is strange, also, that Mr. Goebel did not, during the long period of alleged exhibition of his ingenious achievement, find a man with a talent for appreciating the value of his work and immediately haunting the halls of the Patent Office. It is urged that the dynamo as an economical generator was not then commonly understood; good, but one would think the thought would fry in their brains when the world was singing with the glory of Edison and the incandescent lamp in the eighties.

It is premature to express an opinion upon this remarkable development; when the witnesses have been through the ordeal of cross-examination their testimony can be more accurately weighed.

It will be remembered that a similar claim was made to the telephone by Daniel Drawbaugh, a clever Pennsylvania mechanician, and was supported by the testimony of a great number of his neighbors in the garden spot of Pennsylvania where he resided, and yet his claim was vetoed by the Supreme Court—although by a narrow majority opinion.

If the claims made on behalf of Mr. Goebel are substantiated, the lamp patent will undoubtedly fall, and incandescent lamps will become public property and the right of manufacturing them as free as the air we breathe. That end is not yet come, however. The possibility of its advent kindles an enthusiasm in the electrical public which will make all news of the controversy between the General Electric and the Beacon companies matter of liveliest interest.

CORRESPONDENCE.

OUR BOSTON LETTER.

An Electric Road is talked of between Chicopee and Holyoke, Mass., and a new company is also being organized in Milford, Mass.

A Company has been organized with a capital of $100,000 and will shortly begin work on a plant at Uxbridge, Mass., for the building of electric cars.

The Wellesly and Boston Street Railway Company, the promoters of which are prominent Bostonians, has just been organized, and has applied for a franchise to construct and operate a system of electric roads from Newton Lower Falls to West Newton, Newton and Allston. The capital stock of the company is $100,000, all of which is already subscribed for, and as most of those interested are well-known Boston men residing in the suburbs through which the road will run, there is no doubt about the enterprise proving successful. The plan is to eventually connect all the Newtons, which are among the most flourishing of Boston's many suburban districts, and to run a feeder into the city itself, connecting with the great West End System. Among the heaviest stockholders are Horace B. Parker, George W. Morse, James W. French, Austin R. Mitchell and J. N. Keller.

The Annual Report of the railroad commissioners, which has just been submitted to the legislature of the State of Massachusetts, shows a most encouraging condition of affairs in street railway interests, and a marked improvement over all the preceding years. It is merely an indication of what is to come, and gigantic as some of the figures appear, there is no room for doubt that the figures for 1893 will far surpass them. The reports received from 60 companies show a total mileage of 814.36, and an aggregate capital of $23,540,536. These companies operate 3,659 cars and employ 7,157 men. The total number of miles covered was 29,617,975 and 193,760,783 passengers were carried, an excess of those carried by all the steam railroads of the State of 82,845,329. The gross income for the year amounted to $9,817,537 35. Deducting from this a gross expense of $7,461,224.95, leaves a net income of $2,356,312.40. Out of this dividends amounting to $1,582,696.50 were paid, or an average of 6.72 per cent. on the total amount of capital invested.

Boston, Jan. 28. H. G. T.

OUR CHICAGO LETTER.

George Cutter has just taken an order from the Chicago City Railway Company for 14 miles of extra large Simplex feeder wire. This will have an area of 550,000 circular mils, and over 1,000 miles of No. 12 bare copper wire will be used in stranding the core.

The Central Electric Company, in preparation for the spring trade, are looking about for new quarters in which to house the large stocks of supplies which they have purchased and which their increasing business has compelled them to carry, in order to meet the requirements of their trade and fill their orders with promptness. They report having their eye on several large buildings which will enable them to handle their stock with increased facilities. They have recently added largely to their force, and predict a large trade for the spring.

Personal—E. Wilber Rice, well known as superintendent of the General Electric Company's factories, made Chicago a flying visit this week.—Mr. F. S. Hickok will read a paper on "Arc Light Carbons" before the Chicago Electrical Association at its next meeting, February 14th.—Wm. H. McKinlock, president of the Central Electric Company, has just returned from a short trip in the East, where he has perfected arrangements for the introduction and sale of several new specialties, which, when put on the market, will no doubt create considerable attention and interest among the electrical trade.

Matters in the Department of Electricity at the World's Fair grounds are progressing rapidly. The structure for the booth of the Bell Telephone Company is nearly finished, and the work of decorating will soon be commenced. In regard to the allotment of space in this department, Secretary Hornsby stated that, although space to a certain extent had been given out, there are a number of applications in for space which have not as yet been allotted, and that he would not have his work completed until the latter part of next week. Regarding the recent publication of space allotted by those esteemed contemporaries, the *Western Electrician* and *Electrical Engineer*, Secretary Hornsby says that the matter was published without authority from the department, that it was incomplete and subject to many changes.

Much Interest is Being manifested by the electrical fraternity in general over the case in court this week of the National Electric Construction Company, to secure the amendment of the restraining order obtained against the Sunbeam Incandescent Lamp Company by the Chicago Edison Company. The National Electric Construction Company have been buying lamps from the Sunbeam Lamp Company for their plant, which supplies light to customers in the vicinity of Clark and Madison streets, and the recent lamp decision giving the Edison Company power to restrain their competitors from selling lamps, and their refusal to sell lamps direct to the National Electric Construction Company, has brought about the suit mentioned. The case has been occupying the attention of the court for the last three days, and the last decision given by Judge Grosscup was that the Edison Company will not be allowed to discriminate, but must sell lamps to all who wish to purchase them, and, to hasten the solution of the trouble, he has recommended that a list be prepared and presented to him and he would add enough to secure the stock supply, after which the demand would be made upon the Edison Company for lamps. The outcome of the matter will be eagerly watched by all users as well as manufacturers of incandescent lamps. M. J. B.

Chicago, January 28.

Mr. Outcault Replies to Mr. Stieringer.

TO THE EDITOR OF ELECTRICAL REVIEW:

You printed last week in your columns a letter from Mr. Stieringer in which he terms my drawings of the electrical fountains at the World's Fair "a batch of unreliable news." While in Chicago recently I sketched carefully the situation of the fountains and surrounding grounds. Before I had disposed of my drawings, however, I received from Mr. Stieringer an order for a large bird's eye view of the fountains. In order that I should have his drawing correct he showed me all the plans and drawings, and gave me a great many figures regarding them. I finished his drawing, and subsequently corrected and finished my original with the aid of the information I had gained. Had I not seen Mr. Stieringer's plans I might have assumed that with him in charge of the fountains an exact copy of what had been done by others in the past would represent his work, and have had a fairly good idea of what I was doing.

Respectfully yours,
R. F. OUTCAULT.

New York, Jan. 27, 1893.

Preparations for the Reception of the National Electric Light Association.

Whatever the people of St. Louis undertake they carry out to the end in no half-hearted way. All their energies are put in action, and a recent meeting of the St. Louis Electrical Club at their new quarters illustrates their willingness, as well as that of the leading citizens, to do all in their power to make the visit of the members of the National Electric Light Association, this month, a happy one.

Committees were appointed after several speeches had been made by several of the prominent men of St. Louis.

Mr. J. A. J. Shultz was appointed chairman of the finance committee, and with him were associated James J. Ayer, E. D. W. Meier, George P. Jones, T. M. Ambler, Louis Nahm, C. R. Scudder, Robert B. Annan, Marcus Bernheim, John S. Moffitt, Frank R. O'Neill, F. J. Wade, L. D. Kingsland, Frank Shapleigh, Frank Gaiennie, Goodman King, Ben. Eiseman, Douglas Cook, Ellis Wainwright, A. Siegel, S. G. Booker, John C. Wilkinson.

The executive committee was named as follows: Mr. Nahm, chairman; James I. Ayer, Frank Gaiennie, Nathan Frank and Goodman King.

The club also arranged for the establishment of a buffet for the convenience of the guests.

PERSONAL.

Mr. Edward Caldwell, for several years on the staff of the *Electrical World*, will hereafter be identified with the *Street Railway Gazette*, of Chicago, as editor. Mr. Caldwell is an industrious and capable newspaper man, and the REVIEW extends its best wishes.

Success seems to perch upon the banners of Eugene Phillips, and he has now many more outer walls on which to fling them. The purchase by his company, the American Electrical Works, of Providence, of an extensive new factory and grounds indicates a prosperity that all who know him will gladly note.

Mr. Henry Floy, of the Westinghouse Company, Pittsburgh, visited New York last week, and reported everything booming in Pittsburgh in the electrical line. Mr. Floy is a graduate of Wesleyan University, and also took an electrical course at Cornell, and is a gentleman of ability, and no doubt will make himself felt in this business, where so many young men are successful.

Kind Words Travel Far, Particularly if they Appear in the "Electrical Review."

N. Y. C. & H. R. R. R. Co.,
GRAND CENT. STATION,
NEW YORK, December 10, 1892.

TO THE EDITOR OF ELECTRICAL REVIEW:

No one can tell how far a good word will go. I am reminded of this to-day, by the receipt of a postal card from the interior of India, asking for some of our "Four-Track Series," which you very kindly noticed in the ELECTRICAL REVIEW.

I beg to assure you that we appreciate deeply the kindnesses of our friends of the press.

Very truly yours,
(Signed) GEO. H. DANIELS,
General Passenger Agent.

The Chicago Telephone Company's New General Manager.

Mr. Angus S. Hibbard, for several years past the general superintendent of the American Telephone & Telegraph Company, popularly known as the Long Distance Company, has accepted the position of general manager of the Chicago Telephone Company, and departed for his new scene of work February 1. Mr. Hibbard is one of the most practical, ingenious and farseeing telephone men of the day and with his great energy and progressive ideas will rapidly advance the telephone interests of the great city of Chicago. Improvement will be the order of the day under his direction, and Chicago is to be congratulated over his coming.

The ELECTRICAL REVIEW extends to Mr. Hibbard its congratulations, as the change from general superintendent to general manager undoubtedly carries with it increased remuneration and responsibilities, and although we had come to look upon Mr. Hibbard as one of our regular New Yorkers, now that the long distance telephone is in such admirable working shape between New York and Chicago, we do not feel that he is far away.

Mr. F. J. Hovey, who has been actively identified with the American Telephone & Telegraph Company in various responsible positions for several years past, becomes acting general superintendent, filling the place made vacant by the above change.

Two Lectures on the Telephone in One Evening.

The one hundred and fifty-first meeting of the New York Electrical Society will take place Wednesday, February 8, 1893, at 8 P. M., at Columbia College, Madison avenue and Forty-ninth street.

The evening will be devoted to an experimental and illustrative lecture on "The Telephone, and How We Talk from New York to Chicago."

The lecture will be divided into two parts, to be given, respectively, by Mr. J. J. Carty, electrician of the Metropolitan Telegraph and Telephone Company, of New York, and Mr. F. A. Pickernell, engineer of the American Telegraph and Telephone Company. The following is a synopsis of the lecture:

Part I: By Mr. Carty—The nature of sound and the mechanism of speech. Its propagation and reception by the ear. The physiology of the ear. The evolution of the telephone from the speaking tube; the string or lover's telephone to the electric telephone. Description of the Bell receiver and battery transmitter.

Part II: By Mr. Pickernell—Description of telephone lines in use prior to the opening of the New York-Chicago line. How the size of the wire and other details of the Chicago line were determined. Description of the line in detail from Columbia College, New York, to the exchange, in Quincy street, Chicago, with stereopticon views.

Through the kindness of the Long Distance Telephone Company, the Chicago telephone line has been placed at the disposal of the society for the evening, and telephone receivers distributed throughout the room will enable the audience to hear speech and music transmitted from Chicago.

Members are at liberty to bring ladies. Cards of admission can be obtained on application to the secretary, Mr. Geo. H. Guy, Room 812, No. 203 Broadway, New York.

LETTERS FROM A LABORATORY.—XXXII.

BY JULIAN A. MOSES.

The proper labelling of bottles and other glassware in the laboratory is of primary importance where neatness and convenience are desired. Paper labels, which have been known and used for many hundreds of years, are very valuable in the workshop, and, in fact, no system is perfect that has not a thorough and complete series of labels. The invention of the flexible mucilage which is spread upon the back of the label was quite a step in progress, and since its adoption the inventor has made a fortune out of it. Its use has become almost universal, and the gummed label is now a necessity; for the present age has made it grow beyond the condition of being a convenience.

But where bottles containing corrosive substances require labels, the ordinary gummed paper label does not fill the bill. Something more permanent and resisting is needed. If it is desired to retain the paper label it must be treated in some way so as to make it resist the action of these substances that destroy vegetable fibre. Labels of China or porcelain that may be cemented to the bottle are made, but necessarily they are expensive, as each label must fit the bottle it is intended for. This form is familiar and is valued by pharmacists for its ornamental qualities. Separate glass letters have been used, but again their cost precludes the possibility of their general adoption.

It would, therefore, seem that some method for preparing the cheaper paper label will be welcomed by those so situated as to require them acid proof. Books composed of gummed labels having printed formulæ and names of substances on their face may be purchased at almost any of the large chemical supply houses. But these labels, when applied to bottles, if not protected in any way, are easily affected by corrosive substances, and it, therefore, becomes necessary to coat them in some way so that the varnish will so cover the paper as to prevent the corrosive substance from coming in contact with the label. Many workers have, after pasting their labels on the bottles, dipped them in melted paraffine. If this is not carefully done, it will be found that after a while the paraffine will scale off and the label will be eventually eaten away. In order to cause the paraffine to adhere permanently, it is simply necessary to heat the bottle to a temperature above that of melting paraffine, and allow the label to be thoroughly saturated by the fluid; let the bottle cool slowly and it will be found that the label will remain until it is taken off, and will be perfectly acid proof.

Where it is desired to make a label translucent, so that the black letters may show to the best advantage, the label may be immersed in a solution of Canada balsam in chloroform. A very little of this solution goes a great ways, for it is very penetrating, and the chloroform, evaporating quickly, leaves behind the resinous residue which fills the pores of the paper.

Bottles upon which the labels have been etched are manufactured by many chemical houses. These are excellent for holding corrosive substances, but it is far cheaper to etch the name on the bottle in the laboratory. There are various ways of etching, some of which are very dangerous. Where hydrofluoric acid is used great care must, of course, be used, and suitable lead-lined vessels provided. A method without the dangerous hydrofluoric acid has been in existence for many years, and its simplicity and adaptability commends it where small bottles are to be marked. It is as follows: The bottle to be engraved upon must be covered with paper, except at the places which are designed to be marked. In other words, a stencil plate must be made. This can be cut from ordinary writing paper with a pair of sharp pointed scissors. The paper should be glued to the bottle and put into a cigar or other suitable box, into which are also put about an eighth of a pound of fine bird shot and about half an ounce of medium fine emery. The whole, with the lid of the box tightly closed, should be violently agitated for a few minutes. The soft lead shot allows the particles of emery to lodge in its surface, and the sharp particles thus projecting, as they hit the bare glass, cut minute chips from the bottle, which, in the aggregate, resemble the effects obtained by the etching produced by hydrofluoric acid. While this process is not very rapid its safety and simplicity recommend it.

American Institute of Electrical Engineers.

REPORT OF THE SUB-COMMITTEE ON PROVISIONAL PROGRAMME FOR THE INTERNATIONAL ELECTRICAL CONGRESS OF 1893.

To the General Congress Committee of the American Institute of Electrical Engineers:

GENTLEMEN: The Sub-Committee on Provisional Programme respectfully submits to you the following report:

DUTIES.

The Sub-Committee understands its duties to be as follows:

To suggest what work it is desirable to have done at the coming International Electrical Congress to be held in Chicago in 1893.

To suggest a programme for carrying out this work in the most satisfactory manner to all parties, and with the least loss of time.

RECOMMENDATIONS.

Regarding the work to be done, your committee's recommendations are as follows:

RATIFICATIONS.

1. Ratification of the adoption of units, terms, symbols and definitions by previous International Electrical Congresses.

This is a mere matter of form and an act of courtesy to the preceding congresses. Your committee understands that this was done at both the Paris Congress of 1889 and the Frankfort Congress of 1891. (For the work done at previous congresses see Appendix I.)

NEW UNITS.

2. Defining and adopting practical units for measuring and designating the measurements of the following quantities: Magneto-motive force; magnetic flux; magnetic intensity; magnetic reluctance; electric conductivity, illumination.

It will be noticed that this refers only to the question of what the magnitude of the units shall be, or, in other words, what multiples or sub-multiples of the absolute units they are to be.

Your committee is aware that objections are raised by some to the establishment of units not already in universal use. Past experience, however, has shown that the proper time to establish units is before their need is universally felt, in order to avoid the introduction by different persons or nations, of units of different values, a contingency which will be very likely to arise if not anticipated by concerted action.

Your committee recommends the following:

The value of the practical unit of magneto-motive force to be one-tenth of the absolute unit, that is, equal to $\frac{1}{4\pi}$ ampere turn.

The value of the practical unit of magnetic flux to be 10^8 absolute units or lines.

The value of the practical unit of magnetic intensity to be 10^8 absolute units, that is, 10^8 lines per square centimetre.

The value of the practical unit of reluctance to be 10^{-9} absolute units. (For further explanation of these magnetic units see Appendix II.)*

The value of the practical unit of electrical conductivity to be 10^{-9} absolute units, that is, to the reciprocal of the ohm. This makes it equal to the unit proposed some time ago and known to some extent by the name of "mho." It should be given this value in order that it correspond with the already adopted units.

The value of the practical unit of illumination to be a bougie-decimale at the distance of one meter. The bougie-decimale is the unit of light or candle power already established and is practically equal to one English standard candle; by making the distance a meter, the practical unit will be approximately equal to one-tenth of a carcel-meter, one-tenth of a foot-candle (or "lux") or to one meter-candle or meter-kerze, all three of which units are already in use to some extent.

It has been announced that a proposition will be made at this congress to change the values of some of the practical units which have been adopted by previous congresses and are already in universal use. Among these are the ampere and the farad. It is urgently recommended by your committee that such changes should not be favored, since they would necessarily be followed by great confusion and would of necessity have to be accompanied by some change in these well established names in order to distinguish these new units from those now existing.

3. Adopting names for the following practical units: Magneto-motive force; magnetic flux; magnetic intensity; magnetic reluctance; inductance; electrical conductivity; illumination.

The following names are suggested for these units:

For the practical unit of magneto-motive force, the name "gilbert."

For the practical unit for magnetic flux, the name "weber." This term was formerly applied to a unit of current, but its use in this sense was so limited, and it has been abandoned for so long a time that no confusion would be likely to arise; the context alone would always be sufficient to prevent any possibility of misunderstanding. The name "weber" is preferred on account of the intimate relation between this unit and that of magnetic intensity, for which the name "gauss" is suggested.

For the practical unit of magnetic intensity, the name "gauss." This name has already come into use to such an extent that objections to it will not be likely to arise.

For the practical unit of magnetic reluctance, the name "oersted."

For the practical unit of inductance, the name "henry." This name has already come into use quite extensively, and it

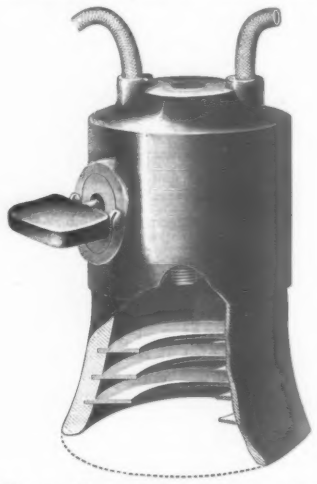


FIG. 1.—CUTTER'S MINE SOCKET FOR INCANDESCENT LAMPS.

would, therefore, be very undesirable to change it. The value of this unit has already been fixed as equal to 10^9 absolute units, or nearly to the length of an earth's quadrant. The definition "quadrant" is sometimes employed as the name itself, but its use as a name is evidently objectionable, as it already has several other meanings, which might readily lead to confusion.

For the practical unit of electrical conductivity, equal to the reciprocal of the ohm, the name "mho." This name has been in use for some time, and is already well known. It is thought better to recommend it than to select and introduce a new name.

For the practical unit of illumination defined above, the name "bougie-metre."

It has been suggested to name the units "kilowatt-hour" and "ampere-hour." Your committee, however, recommends that inasmuch as these terms explain themselves, and are not longer than some others in use, to give them special names would burden a system of nomenclature unnecessarily. The principal objections to the term "Board of Trade Unit," which is in use in England for the former, are, that it could never become international, that it is longer by one syllable than the term "kilowatt-hour," and that there are now, or may soon be, units of other denominations adopted by the same board of trade, from which this one will have to be distinguished by an additional affix or prefix.

CONCRETE STANDARDS.

4. Defining and adopting modes of embodying the following principal units of measurement in concrete standards capable of being readily reproduced, and adopting names for them or for the theoretical units, by which they can be distinguished from each other: Ampere, ohm, volt, watt, standard candle.

The following definitions of these units are recommended:

An ampere shall be that unvarying current, which, when passed through a solution of nitrate of silver in water, in accordance with the specifications recommended in the recent report to the British Board of Trade (see Appendix III), deposits silver at the rate of 0.001118 of a gramme per second.

An ohm shall be the resistance offered by a column of mercury at the temperature of melting ice 14.4521 grammes in mass, of a constant cross-sectional area, and of a length of 106.3 centimeters. It is recommended that material standards of this value, constructed in solid metal, should be preserved under the care of the several governments, as standards of comparison, and that they should from time to time be verified by comparison with the mercury standard defined above; also, that for the purpose of replacing the standard, if lost, destroyed or damaged, and for ordinary use, a limited number of copies should be constructed which should be periodically compared with the standard ohm.

A volt shall be the product of this ampere and this ohm.

A watt shall be the product of the square of this ampere and this ohm.

The other units, such as the coulomb, the farad, and the joule, shall be taken as derivatives in terms of this ampere and this ohm.

In order to create as little confusion as possible by the introduction of this set of units which are to become the universal standards, and in order to distinguish them readily from the true theoretical or abstract units defined in terms of the absolute units, it is recommended to call the former simply "amperes," "ohms," "volts," etc., or more specifically "standard amperes," "standard ohms," etc., and to call the theoretical units "true amperes," "true ohms," etc. The latter term has already come into use in this sense.

The unit of resistance, known as the B. A. unit, shall be taken as equal to 0.9866 of this ohm.

The electromotive force of a Clark cell at 15° C., prepared in accordance with the specification recommended in the recent report to the British Board of Trade (see Appendix III), shall be taken as not different from 1.434 of these volts by more than one part in 1,000. The co-efficient of temperature shall be taken as.....?

The standard candle shall be taken as equal to the light from a lamp like that known as the Hefner-Alteneck standard amyl acetate lamp, which is to be defined by its dimensions and the height of the flame, the dimensions being such that the light shall be equal to that of the "bougie-decimale," the practical unit adopted at the Paris Congress of 1889, which is equal to one-twentieth of the absolute platinum standard adopted in 1884.

It has also been suggested that a universal wire gauge be defined and adopted. Desirable as this may at first seem, your committee recommends that no action be taken by the congress in this matter, as it is not likely that any one scale would ever be universally adopted by manufacturers, even if defined and adopted by a congress. The universal introduction of the metric system, and the designation of wires by their diameters in millimetres, is thought to be the only satisfactory solution of this question for international work.

NOTATION AND SYMBOLS.

5. Adopting an international system of notation and conventional symbols, for designating different quantities.

The system suggested to the last congress by Mr. E. Hospitalier, of Paris (see Appendix IV), is recommended by your committee, although, doubtless, some amendments may be found desirable.

DEFINITIONS.

6. Defining the following terms: Impressed electromotive force, inductivity, inductance, reluctivity, Matthiessen's standard, north and south pole.

The following definitions are suggested:

The impressed electromotive force is the ratio of the total activity in an electrically

FIG. 2.—VIEW OF SAME, SHOWING METHOD OF SUSPENDING LAMP.

conducting circuit to its instantaneous current strength.

The inductivity at any point in an isotropic medium is the ratio, added to unity, of 4π times the intensity of magnetization there existing to the magnetizing flux density. Inductivity is synonymous with "permeability." The electro-magnetic dimensional formula is $L^0 M^0 T^0$; the conventional symbol is μ.

Inductance.—(*a*) Self-inductance is the ratio of the total magnetic induction linked with and established by an electric current to the uniform strength of the same. The inductance of a conducting circuit is constant when its environing medium has constant inductivity. (*b*) The mutual inductance of one electric circuit upon another is the ratio of the total magnetic induction linked with the second, due to a uniform current in the first, to the strength of that current. The mutual inductance between two electric circuits is reciprocally equal when the environing medium has constant inductivity. The electro-magnetic dimensional formula is $L^1 M^0 T^0$. The absolute unit is one centimetre; the practical unit, one henry.

The reluctivity of a medium at any point is the volume differential of the reluctance thereat. Simple definition: Reluctivity is the reluctance per unit volume. The electro-magnetic dimensional formula is $L^0 M^0 T^0$. The absolute unit is one C. G. S. unit of reluctance per cubic centimetre; the proposed practical unit is the same or about one oersted per cubic earth quadrant.

The resistance of copper known as Matthiessen's standard shall be defined as follows: The resistance of a soft copper wire one metre long, weighing one gramme, is 0.14365 B. A. units at 0° C. This definition is recommended by the Committee of the American Institute of Electrical Engineers on Matthiessen's standard (see Appendix V). The reasons for selecting it are given in that report.

The north pole of a magnet to be defined as being that which seeks the geographic north pole, and the south pole that which seeks the geographic south pole. This is the generally accepted definition, but it is thought desirable to formally define it.

EXPRESSIONS.

7. Defining and adopting expressions: For alternating currents of more than one phase; for describing phenomena of alternating currents and of electro-magnetic waves—it is recommended to adopt the following expressions: "Simple" alternating current for the usual alternating currents in which there is practically but a single phase; "diphase" alternating currents for two alternating currents whose phases differ in time by 90 or 270 degrees; "tri-phase" alternating currents for three alternating currents whose phases differ in time by 60 or 120 degrees; "poly-phase" alternating currents for such as have more than three phases.

For expressions describing phenomena of alternating currents and electro-magnetic waves, your committee solicits suggestions.

UNIVERSAL USE.

8. Recommending the more universal use of the term "voltage" as synonymous with "difference of electrical potential," or P. D. in place of the terms "potential," "tension" or "pressure," the use of which in this sense it is recommended to abandon; of the term "transformer" instead of "converter"; of the term "dynamotor" for a continuous current transformer; of the term "continuous current" instead of "direct current"; of the term "kilowatt" instead of "horse-power"; of the metric system of weights and measures, and suggesting means by which its introduction will be facilitated.

PROGRAMME.

Regarding the programme for carrying out this work in the most satisfactory manner to all parties, and with the least loss of time, your committee's recommendations and suggestions are as follows:

PREPARATORY DISCUSSIONS.

It cannot be too strongly urged that an International Congress is the place to close but not to open a discussion on questions about which international agreement is to be had; it is, therefore, urgently recommended that action be taken at once to open the discussion of such matters now, in order that expressions of opinions and, if possible, agreements may be arrived at prior to the meeting of the congress. To this end, your committee recommends that the suggestions embodied in this report, or as many of them as you may see fit to designate, be printed and sent to all the leading electrical and physical societies and journals in this country and abroad, with a request that they aid this work by making them public, by freely discussing them and by sending copies of such discussions and any further suggestions to the General Congress Committee of this Institute, care of the secretary, 12 West Thirty-first street, New York city. That a sub-committee of the Institute prepare from time to time a classified summary of such discussions, to be sent to the leading electric and physical journals for publication here and abroad, and that it present a final summary of this international discussion at the congress. This discussion ought to be closed by July 1, 1893.

It is recommended also that this Institute invite other societies to co-operate with it by appointing special committees to discuss and report to their respective societies on these international questions and to publish their conclusions in the electrical journals of their country.

It has been suggested that various committees be appointed to prepare reports on the international questions on which agreement is desired, and to submit these at the meeting of the congress. Your committee, however, believes that to postpone the discussion until the congress is in session would

*The appendices referred to in this report will be published hereafter.

lead to no satisfactory results, as was shown at the last congress of 1891 in Frankfort. It, therefore, urges that the discussion take place through the medium of the journals *prior* to the meeting of the congress, and that the only report submitted to the congress be a summary of such discussions.

MEETINGS.

Regarding the meetings of the congress, your committee recommends that, as in the Paris congress of 1889, the meetings be divided into (*a*) general meetings, one at the opening and one at the closing of the congress, which are to be devoted to the consideration of general questions and those on which agreements are desired, and to the reading of papers of a general character; (*b*) sectional meetings for the reading of all other papers. The following division into sections is recommended:

1. Electro-physics, units, measurements, and all electrical matters of a purely scientific nature.
2. Dynamos, motors, transformers, etc.
3. Systems, central stations, installations, lamps, etc.
4. Electric telegraphy, telephony and signaling.
5. Electric railways.
6. Electro-chemistry, batteries, electro-metallurgy.
7. Electro-physiology and electro-therapeutics.
8. Legal questions.

PAPERS.

It is suggested that specific invitations be extended by the Congress Auxiliary to prominent electrical engineers and physicists to prepare papers on specified subjects to be read and discussed at the congress meetings. Also, that a general invitation be extended for other papers, which are to be submitted not later than July 15, 1893, to a committee on papers appointed by the chairman of the Congress Auxiliary; that this committee shall examine and accept or return the latter, and at its discretion shall print any or all of those accepted as well as those solicited, in form for circulation at least one week prior to the meeting at which they are to be read; that the papers shall be read in full, in abstract or by title, as that committee shall direct.

The following subjects of papers are offered as a suggestion to the Congress Auxiliary merely as a basis and not as a complete list:

The criterion of sensitiveness of galvanometers, or on the theory of their construction; the working of national or municipal laboratories for testing meters and instruments; the practical results and economy of the employment of accumulators in central station systems of supply; on the relation between weight of copper and iron in dynamos and their output; nomenclature and notation of magnetic circuit, or on standard and units of magnetism; magnetism; on the economic use of transformers under various conditions of supply; electricity meters from an European standpoint; electricity meters from a British standpoint; electricity meters from an American standpoint; choice of materials for standard of electrical resistance; nomenclature of phenomena of electro-magnetic waves; standards for electrical measurement; alternating current transformers from an American standpoint; high frequency and high potential phenomena; dynamo construction.

Your committee suggests that papers should be solicited by the General Congress Committee of this Institute on the work of the early electricians of this and foreign countries considered from a modern standpoint, and their importance in the development of the science of electricity, including descriptions and illustrations of models and apparatus used.

TRANSACTIONS.

Your committee suggests that the proper authorities be requested to have a stenographic report made of the proceedings and discussions at all the meetings of the Electrical Congress, and that this report, including such of the papers and discussions as a committee appointed for the purpose shall direct, shall be printed and published in book form; that each member of the congress be entitled to one copy of this report on the payment of $1 (one dollar), and non-members on the payment of $5 (five dollars).

MEMBERSHIP.

It is suggested that the membership of the congress be divided into delegated members and members; that the dues for each shall be $5 (five dollars); that only delegated members and members be admitted to the meetings and be permitted to take part in the discussions; that any one shall be entitled to become a member; that delegated members shall be appointed by governments, physical and electrical societies, and shall be approved by an international committee, whose decision shall be final; that questions on which international agreement is desired be decided by the delegated members, whose decisions shall be submitted to the whole congress for approval or rejection, in part or in whole, but not for alteration.

It is recommended that the United States government be requested to extend a formal invitation to foreign governments and societies to send delegates to this congress.

ACKNOWLEDGMENTS.

In the present report your committee has embodied recommendations from the reports of the Institute's Committee on Mathiessen's Standard and on Magnetic Units, from the recent reports of the British Board of Trade Committee, and from the suggestions of Dr. Silvanus P. Thompson to Dr. Elisha Gray in reference to the congress.

Respectfully submitted,

(Signed) CARL HERING, Chairman,
WM. A. ANTHONY,
A. E. KENNELLY.

New York, Dec. 28, 1892.

By a resolution adopted at the meeting of the General Congress Committee of the American Institute of Electrical Engineers December 28, the following proposed subjects, suggested by a sub committee of the British Royal Commission for the Chicago Exhibition, were ordered to be published with this report:

Subjects on some of which it is proposed that short and suggestive special papers might be read by specially selected members:

Comparison between procedure in different countries; Methods of avoiding electrical interference and risks to persons and property; Units of magnetic quantities and mode of embodying them in concrete standards; The adoption of the name "henry" for the unit of self and mutual induction; Adoption of the "kilowatt" instead of the "horse-power" as the unit of power; International nomenclature for describing phenomena of alternate currents and of electro-magnetic waves; National and municipal testing laboratories; Materials for standards of electric resistance; Points of difference of the electrical vocabulary used in different countries; The direct conversion of the energy of fuel into electric energy; Comparison of the various methods employed for the electric transmission of power; The cost of insulation in relation to high pressure for the electric transmission of power; Comparison of the economies of the various systems of electric distribution; Alternate current motors; The behavior of transformers when supplying power to alternate current motors; The construction of condensers for alternate current purposes; The measurement of power in polyphase currents; Direct coupled and non-direct coupled dynamos; The use of equalizing dynamos in a three and five wire system; The use of accumulators in central stations; The proportions between output of dynamos and the weight of copper and iron employed in their construction; Electric traction; Application of electric power in mining; The adoption of a uniform method of distinguishing positive and negative mains; Electric supply meters—American, British, Continental; Criterion of sensibility of galvanometers; Commercial instruments for measurement of electric quantities; The relation between the voltage of the arc and the quality and composition of the carbons; The aging of glow lamps; The electric working of metals; The use of electric and magnetic tests for ascertaining the mechanical properties of metals and alloys; The best material and mode of erection of lightning conductors in the light of recent researches in electric discharges; The prospecting for iron by magnetic surveys; International telegraphy; Fast speed and long distance telegraphy; The use of batteries or other generators for telegraphy; Telegraphic lines—land and sea; Harmonic telegraphy; Writing telegraphs; Long distance telephony; The possibility of providing telephonic communication without wires; Application of electric signaling to the working of railways (alarms, time, etc.), and to naval and military purposes; Magnetic separators; The use of electricity in engraving and in art reproductions.

Cutter's Mine Socket.

Incandescent lighting has worked its way into mines and tunnels to but a limited extent, as many of the sockets now on the market were not adapted to this severe usage. There are a number of so-called water-proof sockets made of glass, porcelain or rubber, which apparently shield the interior of the socket from dripping water, but none of these prevent the moisture from creeping upon the lamp and over the cap, thus short-circuiting the lamp and leaving everything in darkness. In the new "mine socket" developed by George Cutter, of Chicago, these points have been considered, and the device is said to be absolutely water-proof. The key socket shown in our cut has a well built interior (with porcelain insulations) protected by a casing of polished hard rubber. The leading-in wires are cemented into the shell, while the handle or key passes through a series of water-tight bushings. Then there are a set of soft rubber rings, which press against the bulb of the lamp when screwed into place, and prevent any moisture from reaching the lamp base. Such a socket can be used with safety in a very damp atmosphere, or in places where water is continually dripping over the lamp and socket.

Cutter's mine socket is made either with or without key, and when intended for use in mines it is fitted with a prong-hook which allows it to be supported in any convenient position.

The illustrations on opposite page present this socket so its many points of excellence may be easily noted.

Charles Clamond's New Microphone.

Under the above title, P. Clemenceau, writing in the *Revue International de l'Electricité*, of January 7, 1893, discusses Clamond's microphone, patented in the United States, November 15, 1892, and numbered 486,244.

As the American technical journals so far have not noticed Clamond's invention, it will be of interest to hear what Mr. Clemenceau has to say about its novelty:

After a few introductory remarks, which set forth that the cry "Un nouveau microphone" is frequently raised only to be dropped shortly, he calls attention to the fact that since Hughes' discovery of the microphone all practical and commercial transmitters, like the Blake, Ader, etc., have been merely new adaptations of the same principle. They all possess what the

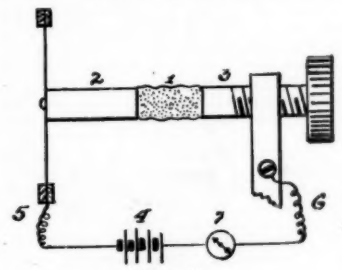


FIG. 1.

author styles contacts "en charbon indeformables." All such instruments to be effective must be operated with a given strength of sound, and any increase in the loudness of sound interferes at once with their commercial usefulness. Thus the inventors of microphones had to construct their instruments for a certain medium strength of sound, and this requirement necessitates in turn some means of adjustment.

These difficulties, according to Mr. Clemenceau, are entirely overcome by Clamond's new microphone. In the words of the American patent, the inventor overcomes these difficulties by resorting to a mode of producing great variations of electrical resistance by sound waves which are accurately proportionate to the amplitudes of said sound waves without at any time breaking the circuit. By this method, therefore, the advantages of the former methods are combined while the disadvantages of the same are completely avoided. This result is accomplished by connecting permanently with two electrodes of the telephonic circuit, and between the same, a plastic semi-fluid electrical resistance which at all times completely bridges the two electrodes, which at no time varies the resistance of transition between itself and either of the electrodes, but which varies its shape, that is to say, its length and cross section under the influence of sound waves, and thereby varies the electrical resistance of the circuit. The variations thus produced have been found to be very accurately proportionate to the amplitudes of the sound waves and to be very great.

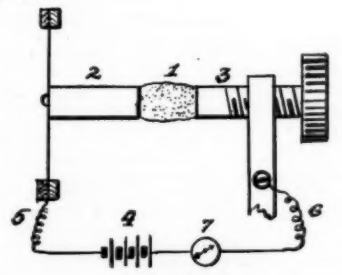


FIG. 2.

The so-called "plastic semi-liquid" electrical resistance consists of an intimate mixture of a finely divided solid and of a liquid constituting as a whole a plastic viscid pasty body of such consistence as is ordinarily called "semi-fluid." Mr. Clamond mentions ordinary potter's clay, the plasticity of which is due to a particular property of silicate of alumina in contact with water, and the conductivity of which is due to both the silicate of alumina and the water. He prefers, however, an artificial compound. This is obtained by mixing concentrated solutions of salts—such as solutions of silicate of soda, silicate of potash, chloride of calcium, or acetate of magnesia—with powders of either conducting or non-conducting bodies in sufficient quantities to make a viscid plastic body of such consistence that it will not flow spontaneously, but will resist only very lightly the action of forces tending to distort their shapes. These powders may be of metal or of carbon, or oxides of metals, or of any non-conducting substance. For practical purposes Clamond prefers to employ pastes in which no electrolytic action takes place, and he obtains this result by mixing conducting powders with sirupy and viscid liquids which are non-conductors of electricity, such as glycerine, viscid oils, like castor oil or vaseline.

By an inspection of the subjoined Figs. 1, 2, 3, it will be easy to understand the principle upon which the new microphone is constructed. Referring to Fig. 1 we see a plastic button 1 between the terminals of an electrical circuit 2-3, charged by a battery 4, with which said terminals are connected, and a current indicator, 7. If one of these terminals 2 3 is fixed and the other is free to move axially under the action of sound waves, then the arrangement shown in Fig. 1 becomes a telephonic transmitter. The resistance changer 1 adheres at each end to one of the electrodes, and if one of them moves axially toward or from the other, the *shape* of the resistance changer is altered. Thus this "resistance changer" may become shorter and thicker, thereby decreasing its electrical resistance, or the microphonic element may become elongated, decreasing in thickness, but increasing its electrical resistance. While such variations of the *total* resistance of the body of the microphonic element take place, no *variation* of resistance occurs at the *surfaces* at which the microphonic element is connected with the electrodes 2-3, in other words, the transition resistance for the passage of the current from electrode 2 to the microphonic element 1 and the transition resistance to the passage of the current from the microphonic element to the electrode 3 remains *constant* during *all* phases of operation, since by reason of the pasty nature of the microphonic element

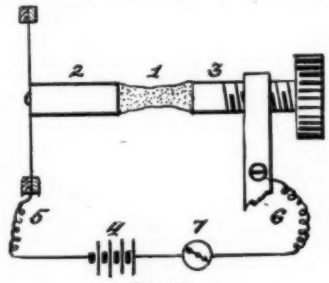


FIG. 3.

the contact of the same with the electrodes is not varied whether these electrodes approach to or recede from each other.

Mr. Clemenceau concludes as follows:

"This new discovery should be of great value for Americans, for in the United States the fundamental patents for the microphone are in the hands of the American Bell Telephone Company. Owing to American law, Berliner's patent, covering the use of microphone contacts between medium conductors, was issued in November, 1891. The Bell Company owns the new patent, and, consequently, can hold 'la main haute' upon all such instruments for 16 years to come. The Clamond microphone is outside of the Berliner patent. The monopoly which has existed in the United States for 17 years to-day is overthrown, and this result is highly satisfactory."

Altogether, the patent question in relation to the Clamond microphone may yet be heard from in the United States.

For the Attention of Mr. Thos. D. Lockwood.

TO THE EDITOR OF ELECTRICAL REVIEW:

The issue of the *Electrical Engineer* for January 11, 1893, contains an article on laminations by Mr. T. D. Lockwood. As the writer states that the data collected by him and embodied in his article are to be used for ready reference, I desire to ask whether or not there is an error in the following paragraph:

"We find (*Annals*, Vol. II, p. 73) that the same gentleman (*i.e.*, Bachhoffner) read a paper before the Electrical Society of London, October 23, 1837, which remarked that in a former paper he had stated that the insertion of a bundle of wires in the axis of the coil increased its power two-fold; he would now say twenty-fold."

Upon consulting such books as I have in my library, I find in "Electricity, Magnetism," Lardner & Walker (Vol. II, p. 517, §515), published in London, 1844, the following statement:

"A most convenient contact breaker is a small upright coil with a *wire* core, which, on becoming a magnet, attracts a piece of soft iron, and so breaks contact; the iron is then set free, and contact is again made. Dr. Bird described the *first* form of this to the Electrical Society (Proceedings, October 14, 1837). Sometimes the coil in use is itself arranged to make and break its own contact."

In other words, Lardner states that Dr. Bird used a coil with a wire core and described this apparatus to the Electrical Society as early as October 14, 1837, while according to Mr. Lockwood, Bachhoffner described a coil with wire core October 23, 1837. It would seem an open question whether Dr. Bird or Mr. Bachhoffner should carry off the palm of priority of invention.

Respectfully yours,

M. N. TRAPP.

New York, January 10, 1893.

Historical Sketch of the Storage Battery.

ABSTRACT OF A PAPER READ BEFORE THE CIVIL ENGINEERS' CLUB, OF CLEVELAND, BY C. F. UBERLACHER.

(*Continued from Last Issue.*)

To all of these troubles must be added another, and probably the most serious one, that of incomplete chemical change on charge and discharge; this is probably the root of most of the others. It is well known to all of you probably that chemical action is liable to differ considerably under slightly varying conditions of temperature and surroundings, so that chemical actions are liable to be different in two parts of the same plate. The appearance of white sulphate is probably due to this cause. It forms not only when the battery is standing idle, as above mentioned, but also when the cells are subjected to a rapid charge or discharge.

Another difficulty with the storage battery is in the bubbling and of the electrolyte. The spray thrown off in rapid charging and discharging is liable to form a conducting film over the jars and supports of the battery, so short circuiting it, in addition to necessitating frequent replenishing of the fluid. The fact that most batteries are supplied with a fluid electrolyte also makes them inconvenient to transport. All of these troubles together seriously reduce the efficiency of the storage battery. Working at its most efficient point, viz., that of slow charge and correspondingly slow discharge, the storage battery seldom reaches an efficiency of 80 per cent.; on the discharge being rapid the efficiency is apt to drop below 50 per cent. and as these are the conditions met with in most of the services which the accumulator is called upon to perform, we cannot safely consider its average efficiency as higher than 65 or 70 per cent.

The idea, however, of the storage battery is an inviting one. From the time of its first invention, and even the time of its first discovery, it has not lacked either inventors to experiment with it or capitalists to furnish the funds for manufacture. It is used far more abroad than in this country. The house to house system in England is probably the only strictly storage battery system at present in existence. Their plan is to place in each house, or in each center, a battery which is charged during all of the 24 hours, and discharge according to the commercial demand for light or power in that district. A very similar scheme was exploited by the Brush Company some four or five years ago.

The accumulator can be used to great advantage in central stations as an adjunct to the dynamo plant. It is placed in shunt across the main leads from the dynamo. When the load is small the potential at the terminals of the dynamo is high, thus causing the current to pass through the storage batteries; when the load increases beyond the capacity of the machines the potential at the terminals of the dynamo falls, and the storage battery supplies current on the lines, thus helping out the machines; or the dynamo plant may shut down entirely when the load is light or in case of accidents, leaving the storage batteries to supply the whole demand. This evens up the load on the machines very much and considerably increases the efficiency of the plant aside from requiring a very much smaller original outlay in machines and engines. This same idea has been introduced to some extent in railway stations abroad. It assists greatly in checking rapid variations in load experienced in that work, and renders the use of compound engines advantageous where it would be impossible to employ them otherwise.

A great advantage of the storage battery is that it can be charged any time when power is handy, and from then on for the next two weeks is in shape to restore a large per cent. of the power put into it. It comes very handy, indeed, in stations where the source of power is intermittent and where lights or motors are wanted at times, and where energy from the main source is not obtainable. In street railways it, of course, gives the advantage of independent units; a breaking down of one car can never disable the entire line. This advantage was realized almost as soon as the storage battery came into prominence abroad, and as early as in 1880 experiments were made in London and Paris for the propulsion of vehicles. In 1883, a car on Kew bridge was operated with accumulators and ran for some time very successfully, but the wasting away of the positive plates soon ate into too much money and the scheme was abandoned. The Julien cars on Fourth avenue, New York, also ran very successfully for over a year. Their operation was, however, hindered by the outcome of certain suits. In addition to this, difficulty was found here, also, with the positive plates.

New Orleans, until recently, had quite an extensive storage battery system, but it has been at last abandoned. The only two roads in regular operation are those at Milford, Mass., and Washington, D. C. Until recently one was in operation at Dubuque, Ia., but it has been thrown out for the trolley system, as the batteries were not found at all satisfactory. In Washington, where the trolleys are forbidden by strict law, the Edco Company is now trying to operate a storage battery system under certain contract guarantees as to cost. Their contract called for the road to be turned over at the end of the first year, and the apparatus to be refused or accepted, according to the results, at the end of that time. Their first year of operation recently ended, and I notice that their time of grace has been extended another year.

The storage battery presents very pretty possibilities for regulating the speed of cars without loss of energy by altering the connections of the cells so as to vary the potential at the terminals of the motor without the use of a rheostat. The most serious difficulties encountered are those of the jarring out of the active material, the rapid deterioration of the positive plates when subjected to a heavy discharge frequently met with in railway service, and the additional weight which has to be carried by the the car up and down grade. The rapid discharge decreases the capacity of the cell very materially, so that a car that would, under ordinary conditions, run 50 or 60 miles with one charging, if called upon to perform extra work in the course of its trip, is liable to become exhausted at the end of 30 or 40 miles, and will then have to be pushed in by the next car coming along.

The weight of the ordinary storage battery is from 100 to 125 pounds per horse-power hour carried. At the speed generally run one horse-power is sufficient to carry a loaded car over one mile of track; of course, not taking into account the grades. One can easily figure from this the amount of extra weight introduced by the use of the storage battery. Say that a car is designed to run 60 miles on a single charging, it would necessitate about three tons extra weight. As a matter of fact, it has been found possible, by lightening the cells and cutting down the quantity of electrolyte, to get the batteries as light as 50 or 75 pounds per horse power hour, but these light batteries have been found to deteriorate so rapidly that their use has been discontinued.

The Waddell-Entz iron and copper battery mentioned above is also considerably lighter than the standard lead cells; it weighs probably about 60 pounds to the horse-power hour, and its life is not injured by this decrease in weight. I find even with these lighter batteries, however, that the increase of power required to climb grades practically rules out the storage battery car in hilly country. A short calculation will show that the extra weight carried on the storage car would increase the horse-power required to run it up a grade at about eight miles per hour at the rate of about one horse-power per cent. This, of course, would, on six or seven per cent. grades, be a very serious disadvantage.

In Brussels the storage battery was abandoned about two years since and the road returned to the use of horses. They found that the cost of the battery renewal amounted to about 2.75 cents per car mile; at Dubuque it was claimed that the cost amounted to as high as 7.22 cents per car mile, but this was probably excessive. The life of the positive plates is generally from 200 to 300 days in railway service, but the negative plates are comparatively indestructible. We have yet to find a storage battery that can even approach the condition of being commercially satisfactory. In situations where the loss occasioned by charging and discharging is not commensurate with the advantage of having a source of power always ready, the better forms of storage battery, with careful attention, give good satisfaction. The accumulator of to-day, however, will not take care of itself, and will not operate successfully, except when in the hands of some one thoroughly accustomed to its peculiarities.

Lunch at the St. Louis Electric Club.

The first noonday lunch was served at the Electric Club on Wednesday, January 25. By a great deal of wrestling House Committeeman James I. Ayer and his associates put into execution the plans for a *café* decided upon at a meeting held the Saturday previous, and early arrivals at the club rooms on Wednesday morning saw some of St. Louis's most prominent electrical workers engaged in the edifying occupation of washing dishes. Lunch was served on time, however, and a mighty good one it was, too. The same plan has been followed every day since, and the increasing patronage of club members and their friends shows that the service is popular. David, a colored retainer, has been engaged as steward, and the brand of coffee he evolves promises to become as historic as the old Goliath whom his biblical predecessor slew. S. L. C.

VIEW IN THE LOUNGING ROOM OF THE ELECTRIC CLUB, ST. LOUIS, ON JANUARY 25, 1893, WHEN THE NOONDAY LUNCH WAS INAUGURATED.

Report of the City Electrical Inspection Department of Chicago.

An idea of the rapidity of the growth of electric lighting and motor installations in Chicago may be had from the following table of the work done by the City Electrical Inspection Department during 1892, submitted by the superintendent, Prof. J. P. Barrett:

Lamps Inspected.

Arc.		Incandescent.	
1892	5,046	1892	101,668
Previous years	14,441	Previous years	190,282
Total	19,487	Total	291,950

Motors Inspected.

		Instal. "wired only."	
1892	504	1892	188
Previous years	668	Generators	345
Total	1,172		

Reinspected.

Arc Lamps.		Incandescent Lamps.	
1892	2,082	1892	30,998

The accompanying statement of the yearly inspection of electric lamps from February 14, 1884, to January 1, 1893, shows the remarkably increasing strides taken during those years by the electric light companies. The increase during the coming year will undoubtedly far exceed that of any previous year.

Year.	No. of Arc.	No. of Inc.
1884	1,148	1,885
1885	329	7,609
1886	479	5,225
1887	837	5,424
1888	2,360	17,717
1889	2,623	24,966
1890	2,682	39,543
1891	3,974	87,913
1892	5,046	101,668
Total	19,487	291,950

The American Electrical Works Greatly Increase their Factory Facilities.

The American Electrical Works have recently purchased from Charles Fletcher the Richmond Paper Company's mills in East Providence, R. I. This property originally cost the paper company $1,000,000, and was sold January 11, at auction, to Mr. Charles Fletcher for $42,000. The American Electrical Works paid something of an advance on this, but consider they have acquired a large amount of mill property at a remarkably low price.

The plant consists of about 28 acres of land, three miles from the city of Providence, upon the Seekonk river, and upon the Providence and Worcester Railroad, affording excellent water and railroad communication. The buildings are mainly of brick and of the following dimensions:

One building, 160x65, four stories; one building, 200x50, one story with attic; two buildings, 150x60, one story; one building, 200x30, one story; one building, 200x40, one story; one building, 130x60, one story.

The one story buildings are constructed with walls suitable for an additional story. Also engine house, boiler house, water filter beds and a large boarding house and several tenements. The steam plant consists of two Greene improved engines of 600 horse-power each, and 14 six feet horizontal tubular boilers, in good order. The water supply is abundant, and of the purest quality.

The plant will be used by them for the extension of their great business, which has been expanding at a wonderful rate under the able business and technical management of Messrs. Phillips, Sawyer and Hathaway.

ELECTRIC RAILWAY AND POWER NOTES.

It is expected that Doylestown, Pa., will soon have a trolley line to Perkasie.

A proposition is on foot to run an electric railway from Haverhill to Salem, Mass.

A petition to connect Portland to Yarmouth, Me., by trolley line has been sent to the legislature.

If all of the proposed electric lines in Massachusetts are built, a bird's eye photograph of the State will look something like a gridiron.

The selection of the route for the contemplated electric line between Norwalk and Milan, O., is involving the projectors and citizens in quite a little trouble.

An electric line to extend from Lewiston to North Conway, Me., through 22 miles of the best towns in central Maine, is the latest project in that State in the way of rapid transit facilities.

Negotiations have been made for the right of way over property near Bound Brook, N. J., and it is said that an electric road connecting Plainfield with New Brunswick, passing through Bound Brook and Somerville, will be started as soon as the weather becomes milder.

It is rumored that a syndicate composed of Western stockholders of the Chicago, Burlington and Quincy road, has purchased the street car lines of Alton, Ill. The whole system it is said will be changed to the trolley, and the power house will supply electric lights for the city.

The subscriptions for the electric road to be constructed in Middletown, N. Y., are coming in rapidly, and the residents are so eager to have the trolley that those who are provided with lists for subscriptions find no difficulty in raising the money. In other words, they know a good thing when they see it.

Judge Shiras, in the United States Court of Dubuque, Iowa, ordered the receiver to sell the entire plant of the Allen & Swiney Electric Railway and Light Company during the first week in March. The liabilities of the company are $400,000. The Bay State Trust Company, of Boston, owned first mortgage bonds to the amount of $200,000, and $30,000 of the second.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

New Electric Railways.

SALEM, MASS.—Surveys have been made for an electric line to be built from Haverhill, through Groveland, Boxford, Topsfield and Danvers, to Salem. There is no grade over five per cent., and the matter will be pushed.

BELLOWS FALLS, VT.—The legislature has granted a charter for an electric railway between Bellows Falls and Saxton's River village, five miles. The incorporators have ceded the rights to the Pettengill-Andrews Company, of Boston, the latter company agreeing to build a substantial electric road between the two towns.

SUPERIOR, WIS.—The Belt Line Electric Company; capital, $600,000; has been incorporated by G. R. Smith, W. B. Perry and R. C. Pope.

LANCASTER, PA.—The Lancaster and Middletown Electric Railway Company; capital, $500,000. Luther C. Bent, president of the Pennsylvania Steel Company, is president.

NORTHAMPTON, MASS.—Parties from out of town have been trying to buy up the stock of the Northampton Horse Railway, for the purpose of putting in an electric road.

PATERSON, N. J.—Stockholders of the Central Electric Company have formed a new company for the purpose of building a belt line around Paterson.

OSKALOOSA, IOWA.—New blood has taken hold of the electric street railway scheme, and an option has been taken on the present horse car line.

BROOKLYN, N. Y.—The Brooklyn, Bath and West End Railroad has been purchased by E. E. Deniston, the representative of the syndicate which has been investing heavily in Brooklyn street railways. It is believed that electricity will be substituted for steam on the road.

STATEN ISLAND, N. Y.—The Electric Railway and Development Company has been incorporated with a capital stock of $200,000. This company will at once begin work on nine miles of road between Linoleumville to Port Richmond. The officers of the company are Percy Thompson, president; Joshua Brown, vice-president; T. T. Greene, secretary; and F. A. Ware, treasurer.

ATLANTIC CITY, N. J.—The Atlantic City Electric Light and Power Company has issued $200,000 in bonds, the proceeds to be used in building an electric railway along the beach.

ALTON, ILL.—New incorporation papers for the Alton Electric Street Railway Company have been drawn up in the interest of the eastern syndicate which recently purchased the road. The capital stock is $250,000, and the incorporators are Manning Mayfield, Henry G. McPike and John F. McGinnis.

INDIANAPOLIS, IND.—R. T. McDonald, of Fort Wayne, Ind., has agreed to purchase the park of R. C. Light, and make it a place of suburban attraction, provided he can secure a franchise to build an electric line from the city to that point.

LANCASTER, PA.—A charter has been granted to the Lancaster and Philadelphia Electric Railway Company, which will build an electric line from Lancaster to Downingtown and Bryn Mawr, and there connect with the electric road to Philadelphia. The capital is $1,500,000, and the directors are John F. Patterson, Robert McWeen, W. J. North and L. Banks.

COLORADO SPRINGS, COLO.—A scheme is on foot to build an electric railway from Colorado Springs to Cripple Creek. Among those interested are C. B. Wilder, of Colorado City; Frank Earle, of Colorado Springs, and J. H. Jewett, of Green Mountain Falls.

MAMMOTH SPRINGS, ARK.—The North Arkansas Railway Company; capital, $100,000. P. Arlund, president; R. D. Welch, vice-president and general manager, G. C. Buford, secretary, and H. G. King, treasurer. The company proposes to build and operate a street railway and electric light plant.

WILMINGTON, DEL.—The Wilmington and Brandywine Springs Electric Railway Company; capital, $100,000, has applied for a franchise to build an electric railway from Wilmington to Brandywine Springs. The incorporators are Robert C. Curtis, L. H. Ball and Frank B. Carpenter.

LYONS, N. Y.—For some time passed the project of building an electric railway in this city has been agitated by local capitalists, but no definite action was taken until recently, when a combination was effected between the Lyons holders of the franchise and a syndicate of Philadelphia capitalists. The work of laying the tracks will be begun as soon as the weather permits.

AKRON, O.—The electric railway from Barberton to Ravenna, 27 miles, is now an assured fact. The People's Electric Company, with a capital of $250,000, has been incorporated for the purpose of building the road. The directors are H. A. Robinson, Alfred Akers, E. M. Buel, Cyrus Bailey and H. J. Stambaugh.

TYLER, TEX.—The street railway company will extend its lines and change to the electric system.

READING, PA.—Another suburban electric road will be built as soon as councils grant the necessary terminals. John A. Rigg and M. B. Knight are interested.

SPRINGFIELD, MASS.—The Springfield Street Railway Company will probably build an electric power plant in the spring.

BUFFALO, N. Y.—The Buffalo and Tonawanda Electric Railway Company has filed its papers of incorporation in Albany and in the county clerk's office of Erie County. The company will build an electric railroad four miles long, beginning on the Military road, at the city line of Buffalo, and terminating at the northerly line of Sweeney street, in North Tonawanda. The capital stock is fixed at $100,000, consisting of 1,000 shares of $100 each.

MARION, IND.—A franchise has been granted by the county commissioners for an electric railway from Marion to Gas City, a distance of six miles. This is the beginning of a system which is expected to connect all the principal points in the Indiana gas field by electric road.

NEEDHAM, MASS.—A company is about to be formed to be known as the Needham and Newton Electric Railroad Company. The road will be about five miles in length.

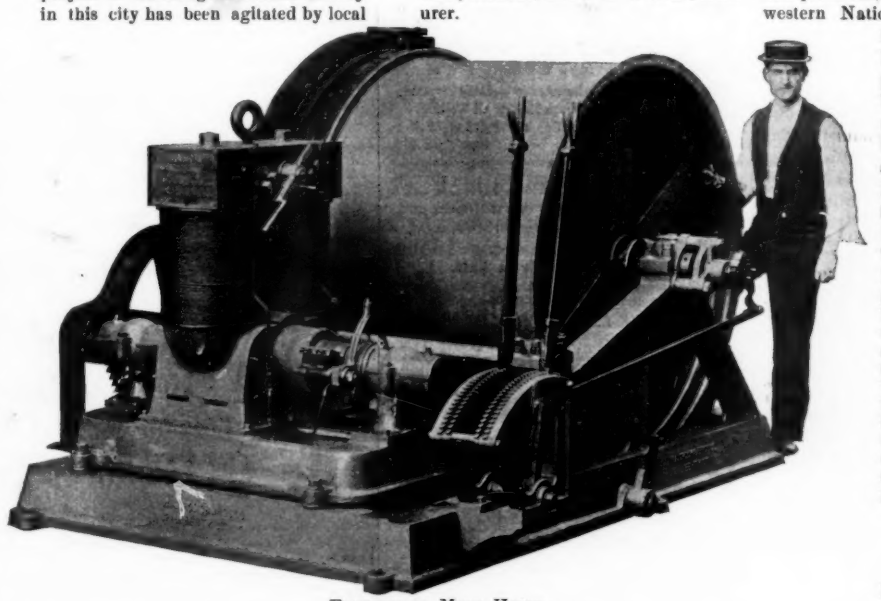
WISSINOMING, PA.—The Wissinoming, Bustletown and Somerton Railway Company; length, eight miles; capital, $50,000; has been organized by Geo. A. Castor, Henry Morris and others, of Philadelphia.

MAHANOY CITY, PA.—Lakeside Railway Company has been incorporated with a capital of $30,000.

DICKINSON CITY, PA.—The Olyphant and Winton Traction Company; capital, $33,000. Incorporators, Jos. A. Dolph, Jiles Moses, Thos. Guer.

Electric Light and Power.

KENNETT SQUARE, PA.—The Electric Light and Power Company; capital, $20,000, has applied for a charter. W. W. Gawthorp, president; J. M. Palmer, vice president; and J. E Worrall, treasurer.



ELECTRICAL MINE HOIST.

TIFFIN, OHIO.—The Edison Electric Illuminating Company's plant was totally destroyed by fire on the morning of January 17. Loss about $20,000; insurance, $15,000.

PHILADELPHIA, PA.—The Schuylkill Illuminating Company; capital, $30,000. Incorporators, L. Knowles Perot, Chas. P. Perot and N. C. Hannis.

CATASAUQUA, PA.—The Catasauqua Electric Light and Power Company. Incorporators, James Thomas, R. A. Thomas and Charles R. Horn.

LEWISTOWN, MONT.—Cyrus Styles will form an electric light company. The plant will be in operation by June 1.

GRAND RAPIDS, MICH.—A scheme is in progress here to use the water power at Lowell for the generation of electricity to be transmitted to this city. The Peninsular Electric Company will continue doing business on the present basis, and a new company will be organized, with substantially the same stockholders, to take charge of the long distance enterprise. The company will have a capital of $250,000.

New Manufacturing Companies.

HELENA, MONT.—The Union Multiplex Telegraph Company has been incorporated with a capital of $20,000,000, for the purpose of building telegraph lines in Montana. George P. Shockley and Richard H. Gatling, of New York, are the incorporators.

DENVER, COLO.—The Colorado Electric and Gas Company; capital, $500,000. Incorporators, W. H. James, Orrin Allen and H. C. James.

The Great Western Manufacturing Company.

The Great Western Electric Supply Company, of Chicago, has invested in a large and convenient factory formerly owned by the Phœnix Company at Duluth, Minn. A committee from the Great Western visited the grounds and buildings and found they were admirably adapted for their purposes, and it was decided to organize a new company, to be known as the Great Western Manufacturing Company, which will purchase all the interests of the Phœnix Company, Great Western Electric Supply Company, Chicago Insulated Wire Company and the Western Electrical Supply Company; $200,000 additional capital has been arranged for, and operations have already been commenced at Duluth, and it is expected the new company will be running in full blast in the course of the next 30 days. The present stockholders of the Great Western Electric Supply Company own a controlling interest in the new company. Duluth is one of the most important cities of the northwest, located at the head of lake navigation, and is rapidly expanding. The location is in every way, an excellent one, and the company will rapidly extend its business.

The new company is incorporated with a capital of $1,500,000, of which $200,000 is preferred.

The officers of the new company are as follows: President, T. B. Casey, formerly vice-president, now director in the Northwestern National Bank of Minneapolis; first vice-president, Roger S. Munger, president of the Imperial Mills Company, the largest flouring mills in the northwest, also director of the bank of West Duluth; second vice-president, Col. C. H. Graves, president of Lake Superior Elevator Company, Duluth, member Board of Trade; third vice-president, Hon. Stephen J. Young, capitalist and president of the Union National Bank, Brunswick, Me.; treasurer and secretary, H. A. Odell, of Chicago, representing Gov. W. R. Merrian, president Merchants' National Bank, St. Paul, Minn.; manager, E. R. Gilman, formerly president of the Northwest Thomson-Houston Electric Company, St. Paul, Minn.

A New Mining Hoist.

A new electrical mining hoist has been recently brought out by the General Electric Company, which is constructed with the especial object of obtaining a wide range of hoisting speed, to which end the controlling apparatus has been carefully perfected. The drum is of unusually large diameter, and is connected by an intermediate gear to the armature shaft of a 25 kilowatt (30 horse-power) motor of the General Electric Company's regular bi-polar type. The controller for the motor, which is not shown in the cut, is similar to that used in street railway service, and is erected on a separate support, conveniently within reach of the operator and directly to the right of the levers. These can then be operated with the left hand, and the controlling switch with the right. The series method of electrical control is adopted, the speed being increased or decreased to meet requirements by the movement of the switch handle. The hand brake is of the band type lined with wood, and extends almost entirely round the drum. The drum is thrown into operation by a clutch operated by the second lever.

The range of speed obtained on this hoist is very wide. It is designed to raise loads of 1,300 pounds at a rate of 600 feet a minute, and has successfully accomplished this. It can also raise loads 100 pounds at a speed not exceeding 20 to 30 feet a minute.

The motor is erected on its own bed-plate bolted to the bed plate of the hoist proper, the whole apparatus occupying comparatively little space, owing to its compact construction.

This hoist, by its specially advantageous features, should command the attention of mine managers and superintendents anxious to procure the most efficient apparatus.

KINDRED INTERESTS

The Riker Electric Motor Company, Brooklyn, has issued a particularly attractive illustrated catalogue devoted to the use of electrical apparatus in marine service. If you get a copy you will preserve it.

One of the Most Complete articles of its kind is the new improved Ries regulating socket, which made its appearance on the market a short time ago. The mechanical and electrical construction of this device is said to be the finest of the kind ever turned out.

The Southern Electrical Supply Company, of St. Louis, Mo., owing to increasing business, has removed to new and enlarged quarters at No. 11 North Seventh street. This company is one of the leading houses in the Southwest and deserves the success it is winning.

The Berlin Iron Bridge Company, of East Berlin, Conn., have received the contract for rebuilding the tube mill, of Curtis & Company, at Cohoes, N. Y., lately destroyed by fire. The new plant will be fire proof, constructed entirely of iron and brick, no wood work being used. The building will be 132 feet wide by 131 feet long, with a wing one side 20 feet wide by 74 feet long.

The Central Electric Company have recently placed the Interior Conduit and Insulation Company's system of tubing and ducts in several of the largest buildings in Chicago, St. Louis and other Western cities, the Newberry library building, the New Athletic Club, Congress Hall, and several other large buildings in Chicago being equipped throughout with this now essential system. The business for the past year done by this company has been a very large one, and everything indicates that the spring trade will be far in excess of any previous season.

Frank R. Chinnock, 18 Cortlandt street, N. Y., Eastern agent for the Ball Engine Company, of Erie, Pa., reports large sales of this well known engine throughout his territory. The following are among the recent orders he has filled:

Buffalo, North Main and Tonawanda Street Railway Company, Tonawanda, N. Y.; Ithaca Street Railway Company, Ithaca, N. Y.; Seabury & Johnson, East Orange, N. J.; Hahne & Company, Newark, N. J.; Dow's Stores, Brooklyn, N. Y.

The Ball Engine Company recently issued a handsome descriptive catalogue, and Mr. Chinnock will be pleased to furnish them to any one desiring information on automatic high speed engines for electrical purposes.

LOCATIONS FOR FACTORIES.

Chicago, Milwaukee & St. Paul Railway Co.

INDUSTRIAL DEPARTMENT.

The Chicago, Milwaukee & St. Paul Railway Company desires to have the raw material on its 6150 miles of road in Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota and North Dakota utilized.

In addition to the vast agricultural resources, its territory comprises forests of hard and soft wood, mines of iron and other metals, coal and other minerals, quarries, clays of all kinds, tanbark, flax and other products. Water powers (both river and artesian) are also still available.

A number of new factories have been induced to locate—largely through the instrumentality of this Company—at enterprising towns on its lines.

As the interest of the Company is to secure the location of industries at places where the surroundings will insure their permanent success, the information furnished a particular industry is pertinent and reliable.

The people on the whole System are one live and thriving community of business men, in whose midst it is safe and profitable to settle. Local capital is being largely invested in local factories, and, taken as a whole, the country through which the road runs is commanding attention as the coming industrial territory of the United States. Solid concerns, manufacturers, large or small, who thoroughly understand their business are sought for at suitable points on the road.

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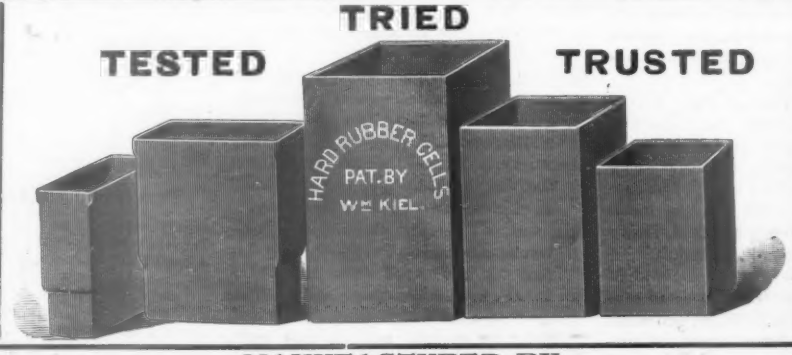

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